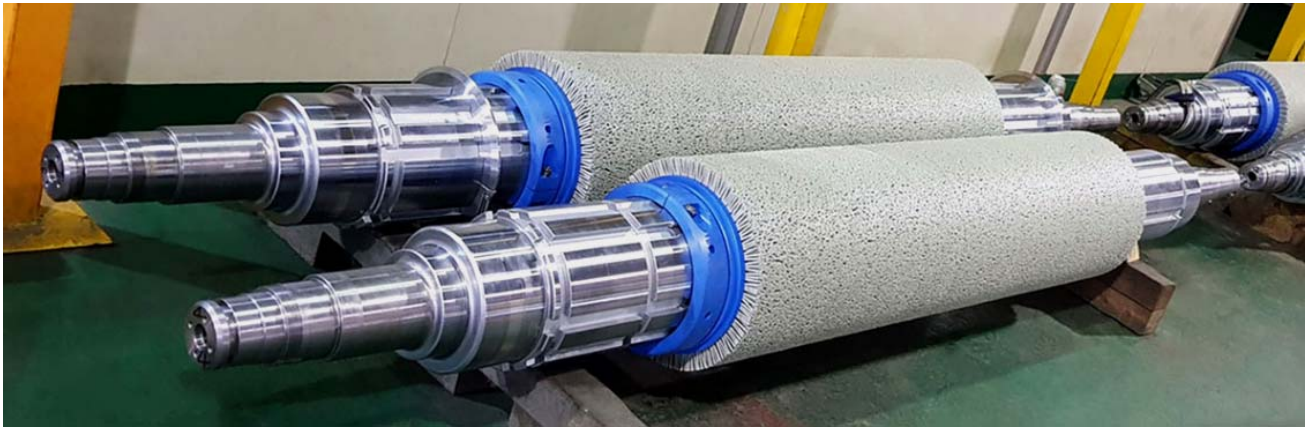


# Technical Information for Brush Roll

---



# Brush Roll

## Brush Roll

### Brush Roll이란?

Brush Roll은 Strip의 표면사상(表面仕上)을 완전하게 하여 품질 향상에 기여함은 물론 표면에 떨어지는 이물질 및 먼지 등을 청소하므로 후단의 Roll 관리 보전에 중요한 역할을 하여 생산성 향상 및 원가 관리를 위한 설비관리 합리화의 일단을 맡고 있습니다.

### 용도

철강, 비철금속 등 Strip 표면의 De-scale, De-grease, Cleaning용 Brush Roll로서 폐사에서는 초극박 Foil부터 철강 Descale용까지 용도에 맞는 Bristle의 직접 압출을 통하여 고객사의 Need에 맞는 Brush Roll을 제작하고 있습니다.

## Collaboration with Hotani



Confidential Agreement between Hotani & Korea Toho  
(Contracted on 6<sup>th</sup>. Nov. 2015)

Basic Sales & Purchasing Agreement  
between Hotani & Korea Toho  
(Contracted on 18<sup>th</sup>. Dec. 2017)

일본 Hotani사와의 기술제휴협약을 통하여 보다 다양하고 우수한 품질의 제품을 공급 드릴 수 있습니다.

# Brush Roll

## Manufacturing Process

### Brush Bristle Manufacturing Process

A - 원료혼합

B - 원사압출

C - 원사연신

D - Covering

E - Dipping

F - Drying

### Brush Roll Assembling

#### Disk Brush Type

A - Disk 식모

B - Disk 준비

C - Press

#### Spiral Brush Type

A - Winding

#### Cassette Brush Type

A - Cassette Making

### Cutting/Inspection

A - Cutting

B - Balancing

C - Brush Roll 완성



Cutting



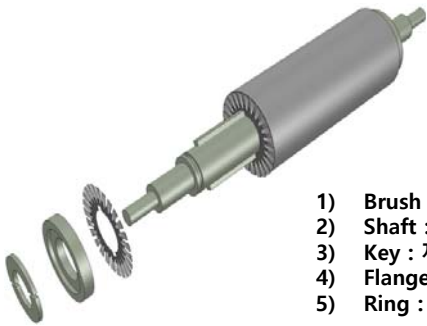
Dynamic Balancing

# Brush Roll

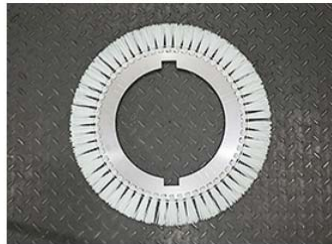
## Brush Roll의 종류 - Type별

### 1) Disk Brush Roll

원반 모양의 철판(디스크) 곡면부에 타공한 후 Brush Filament를 채워 만드는 Brush 제작의 한 형태입니다. 이러한 디스크 판을 적층시켜 Brush Roll을 제작합니다.



- 1) Brush : 각각의 Disk로 압착, Roll 표면이 Strip과 접촉하여 사용됨
- 2) Shaft : 금속성분으로 이루어진 Roll Shaft, 사용시 베어링에 고정됨
- 3) Key : 제품 사용시 Brush Disk가 걸리지 않도록 고정하는 장치
- 4) Flange : Shaft에 Brush Disk를 압축 후 고정시킴
- 5) Ring : Stopper 역할



## Advantage

### 1 High density

The density of a brush roll is controllable by adjusting the number of disks to fill. Especially, brushing marks (unevenness) can be reduced by controlling the density of the brush roll. Keeping high density helps the brush roll use a long time even in a severe condition.

### 2 Stable quality

Disk type can reduce falling out of bristles from the brush roll because the bristles in each hole are less interfered with the others. In case of the damaged bristles, a partial replacement of brush disks is possible.

### 3 Valuable disk application

There are three types of disk applications to suit depending on required quality and cost.

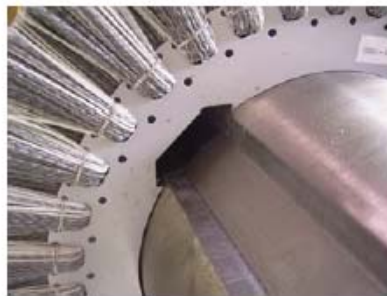
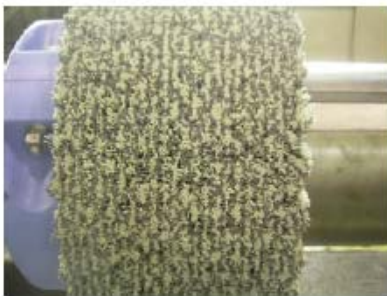
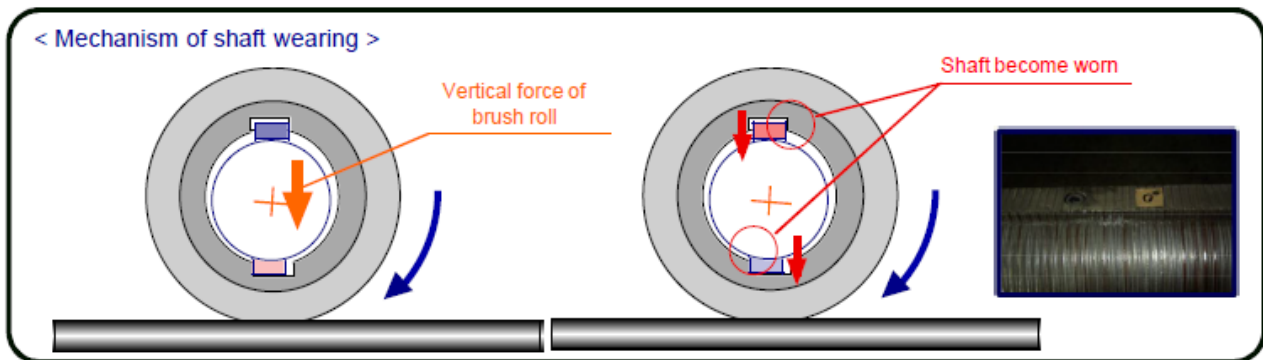
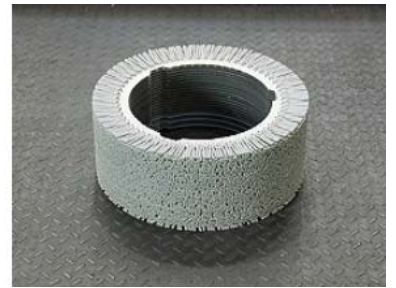
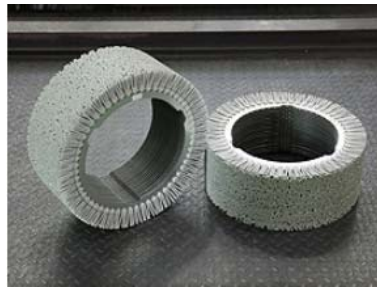
Disk application	Zenshoku (Normal type)	Chidori (Stagger type)	Zenshoku-Chidori (New stagger type)
Appearance			
Description	The most basic application	Mainly used for fine brushing purpose	Mainly used for abrasive purpose

# Brush Roll

## Brush Roll의 종류 - Type별

### 2) Disk Cassette Brush Roll

Brush Disk를 일정한 길이의 블록 형태로 만들어 최종 사용 고객이 ROLL SHAFT에 조립하여 사용합니다.



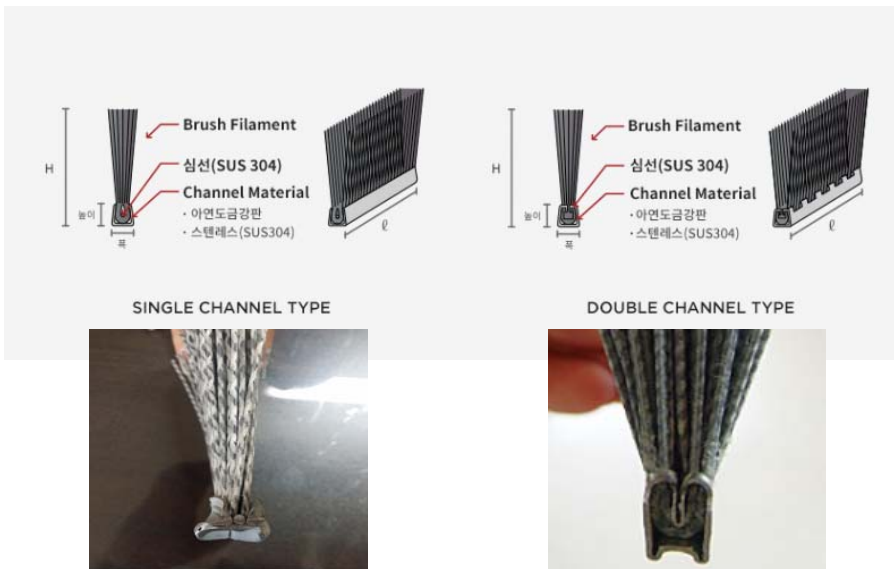
위 사진과같이 확장키를 사용하여 Cassette를 고정시킴으로써 Shaft와 Cassette간 유격을 원천적으로 제거하여 Roll 구동시의 Chattering Mark, Shaft 손상 등을 방지할 수 있습니다.

# Brush Roll

## Brush Roll의 종류 - Type별

### 3) Spiral Brush Roll

Spiral Brush Roll은 Brush Filament를 Channel을 이용하여 Shaft에 연속적으로 감아 사용하는 Roll



Spiral Brush Roll은 Single Channel Type과 Double Channel Type 두 종류가 있으며 Double Channel Type은 가공된 Channel과 심선 Channel이 Brush Filament를 강하게 Holding하여 Disk Brush에 준하는 모밀집도로 뛰어난 세정력을 발휘합니다.



Double Channel Spiral Brush Roll

# Brush Roll

## Brush Roll의 종류 - Type별

### 4) Spiral Cassette Brush Roll

Double Channel Spiral Brush를 Shaft에 직접 감지 않고 필요 사이즈에 따라 일정한 길이의 카세트 블록 형태로 제작하여 고객사에게 공급, 현장에서 Shaft에 조립 후 핀 플랜지로 고정하여 사용 가능한 Brush Roll Type입니다.



Spiral Brush Cassette



Spiral Brush Cassette 제작



Spiral Brush Cassette 조립



조립 Flange 체결

# Brush Roll

## Brush Roll의 종류 - 용도별

### Product List by different use

	wipe	wash	polish	middle grind	high grind	descale
C type : Cleaning brush	■					
M type : Middle abrasive brush			■			
H type : Heavy abrasive brush					■	
D type : Descaling brush						■
F type : Fine polishing brush	■					

#### C type : Cleaning Brush

##### Brush Name : C-08

C-08 is the brush which is consisted of micro filaments in "wipe" category. This is applicable for soft or mild materials and is expected to clean the surface, which is not allowed any scratches.

Reference line : Bright Annealing Line, Aluminum Cleaning Line, Copper Cleaning Line and etc.

>To see the supply list of Cleaning Brush (C-08)



To enlarge Picture

##### Brush Name : C-32

C-32 is the mixture of "Wiping" and "Cleaning" brush rolls, called "Hybrid brush". This is one of the most effective brush products to remove oil and iron fines ideally.

Reference line : Continuous Galvanizing Line, Continuous Annealing Line, Electrolytic Cleaning Line and any Cleaning Line.

>To see the supply list of Cleaning Brush (C-32)



To enlarge Picture

#### M type : Middle abrasive brush

##### Brush name : M-37

M-37 is categorized in "Polishing" or "Light Abrasive" brush. This is mainly used in the skinpass mill roll for removal of the rolling powders.

Reference line : Continuous Galvanizing Line (for skinpass mill roll)

##### Brush Name : M-33

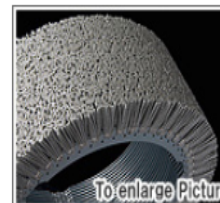
M-33 is categorized in "Light/Middle Abrasive" brush. This remarkably removes the oxide scale of the hot rolled stainless steel surface and enhances pickling efficiency.

Reference line :

Stainless Steel... Hot rolled Annealing and Pickling Line (Prior to or after acid tanks)

Carbon Steel... Continuous Pickling Line

>To see the supply list of Abrasive Brush (M-33)



To enlarge Picture



# Brush Roll

## Brush Roll의 종류 - 용도별

### Product List by different use

	wipe	wash	polish	middle grind	high grind	descale
C type : Cleaning brush	■					
M type : Middle abrasive brush			■			
H type : Heavy abrasive brush					■	
D type : Descaling brush						■
F type : Fine polishing brush	■					

#### D type : Descaling brush

##### Brush name : D-100

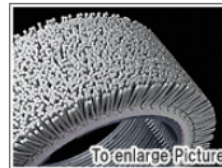
D-100 is the descaling brush, and one of the most aggressive brush roll. This is mainly used as mechanical descaler at the prior to the first acid tank in the pickling section (Stainless).

Reference line :

Stainless Steel... Hot rolled Annealing and Pickling Line (Prior to the first acid tank)

Carbon Steel... Continuous Pickling Line

> [To see the supply list of Descaling Brush \(D-100\)](#)



To enlarge Picture

[Go back to PAGE TOP](#)

#### F type : Fine polishing brush

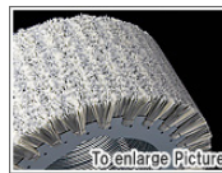
##### Brush name : F-21

F-21 is the special typed cleaning brush roll. This is used for cleaning the strip surface at high speed line or galvanizing line which is required superior cleaning performance.

Reference line :

Carbon Steel... Continuous Galvanizing Line, Continuous Annealing Line and etc.

Stainless... Cold rolled Annealing and Pickling Line



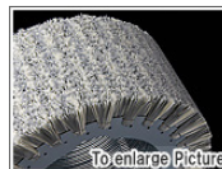
To enlarge Picture

##### Brush name : F-22

F-22 has a little higher abrasive effect compare to F-21. This is also adopted in the lines required better cleaning performance.

Reference line :

Continuous Galvanizing Line, Continuous Annealing Line and etc.



To enlarge Picture

##### Brush name : F-105

F-105 has unique feature which can be operated under the dry condition at skinpass line (No water or coolant is required). And this is used for continuous removal of milling powders from the roll surface.

Reference Line :

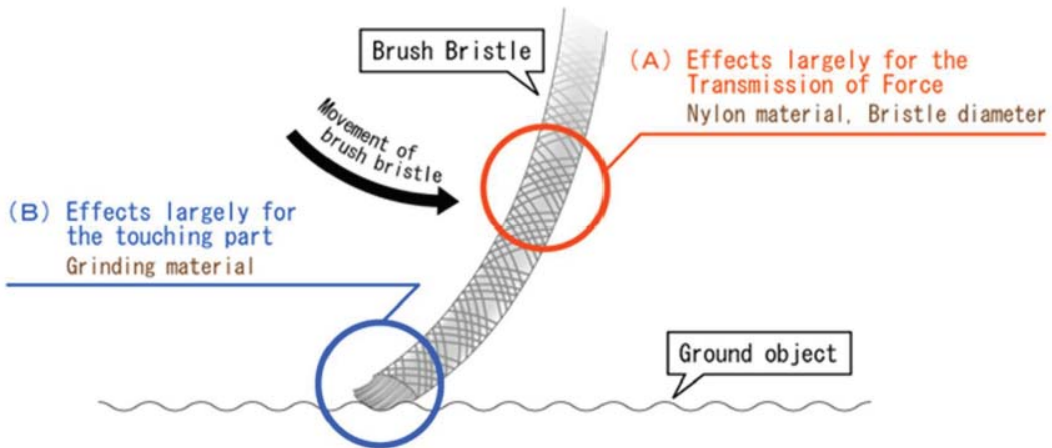
Skinpass Mill Line (For tin-plate), Temper Mill Line (For tin-plate) and etc.



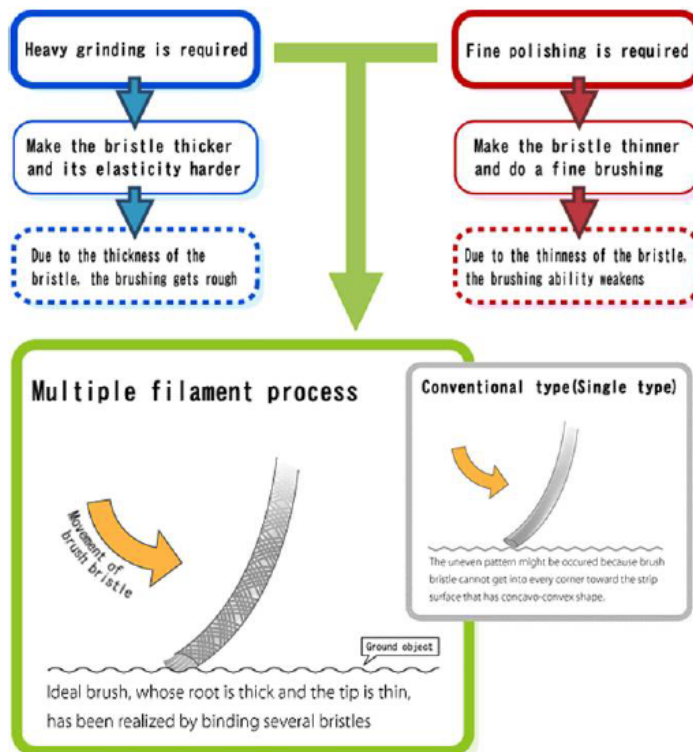
To enlarge Picture

# Brush Roll

## Multi Filament



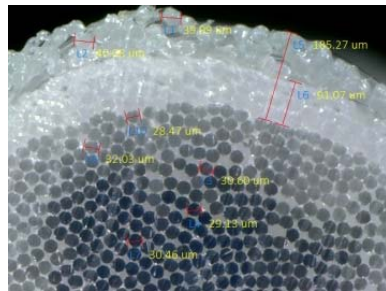
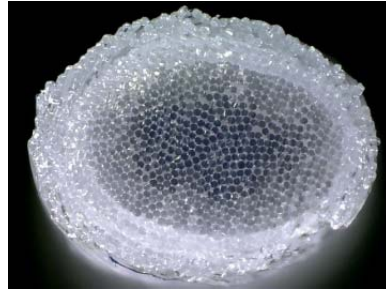
There are two functions of brush bristle. "Function as the transmission of force to the brush tip (A)." And "Function as touching with the strip and grinding (B)." Optimization of two functions can be approached to the effective brushing.



# Brush Roll

## Multi Filament

C-08

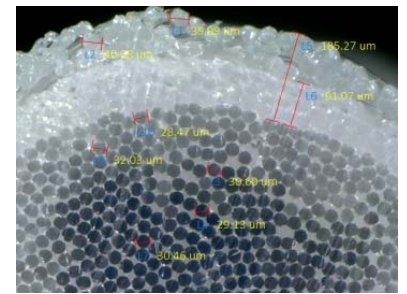
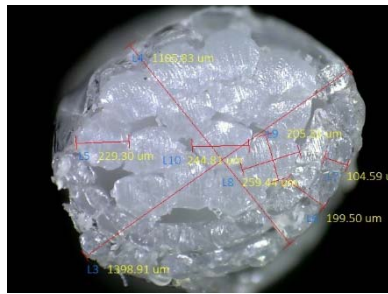


	WHITE FILIMENT
CORE YARN	0.02mm
# OF COVERING FLAMENT	About 600
GRINDING MATERIAL	NILL
FRID NUMBER	NILL
STRENGTH(N)	424
ELENGATION(%)	22

# Brush Roll

## Multi Filament

C-119

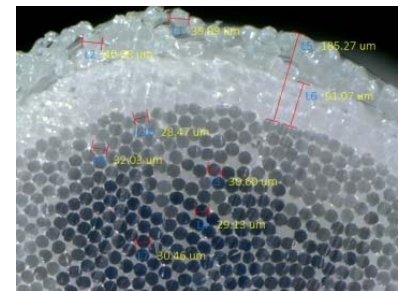
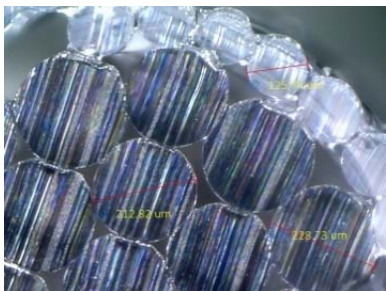
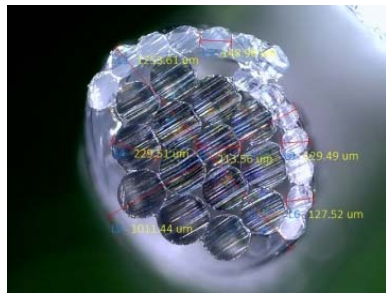


	GRAY FILAMENT	WHITE FILIMENT
CORE YARN	0.2mm	0.02mm
# OF COVERING FLAMENT	14	About 600
GRINDING MATERIAL	NILL	NILL
FRID NUMBER	NILL	NILL
STRENGTH(N)	318	424
ELENGATION(%)	32	22

# Brush Roll

## Multi Filament

C-32

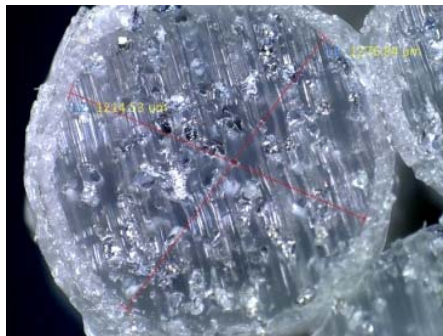
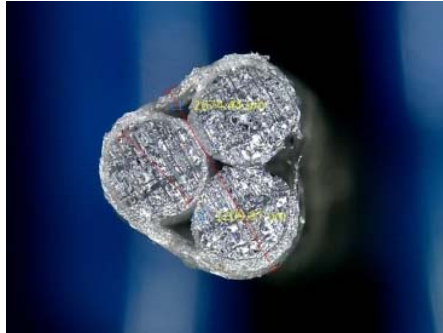


	GRAY FILAMENT	WHITE FILAMENT
CORE YARN	0.2mm	0.02mm
# OF COVERING FLAMENT	14	About 600
GRINDING MATERIAL	NILL	NILL
FRID NUMBER	NILL	NILL
STRENGTH(N)	318	424
ELENGATION(%)	32	22

# Brush Roll

## Multi Filament

M-51



	WHITE FILIMENT
CORE YARN	1.2mm
# OF COVERING FLAMENT	3
GRINDING MATERIAL	SiC
GRID NUMBER	240
STRENGTH(N)	559
ELENGATION(%)	16

# Brush Roll

## Multi Filament

M-69



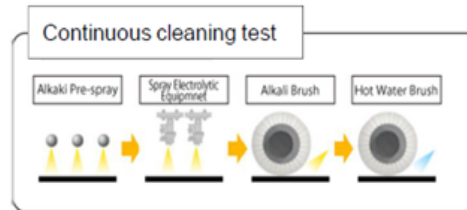
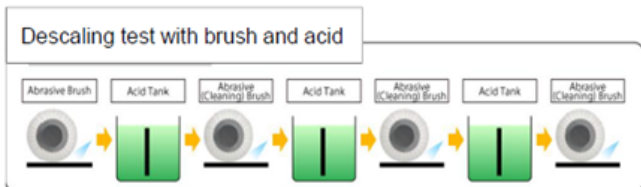
	WHITE FILIMENT
CORE YARN	1.2mm
# OF COVERING FLAMENT	3
GRINDING MATERIAL	SiC
GRID NUMBER	240
STRENGTH(N)	559
ELENGATION(%)	16

# Brush Roll

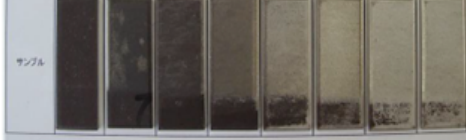
## Advanced Laboratory Facility



We established the new research and development center in October 2011. At the same time, we upgraded the brush roll test line and the cleaning test line. In addition, the pilot manufacturing line of new filament was installed to accelerate the development.



	鋼板	○	○	○	○	○	○	○	Q	合計
鋼板量 (g/m <sup>2</sup> )	—	23.12	9.12	39.82	5.98	7.43	9.89	3.21	74.96	
Ra (μm)	1.84	1.17	1.11	1.19	1.06	1.19	1.40	0.85		
厚さ (μm)	13.1	10.3	11.3	8.12	10.3	9.87	10.8	6.25		
生油量 (mg)	5.7	19.2	7.4	47.0	35.3	72.5	14.0	52.7		
生油付率 (%)	3.2	8.7	4.1	15.0	13.8	18.8	19.4	21.1		



Tape check (L-value)

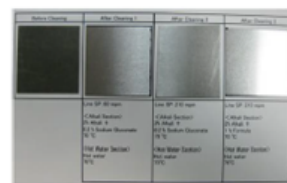


表1 分析結果

試料No.	油量 (mg/m <sup>2</sup> )	鉄粉量 (mg/m <sup>2</sup> )
No.11	3	16
No.12	9	18
No.13	9	23
No.14	3	20
No.15	6	18
No.16	2	15
77ラインNo.12の基準	96	120
77ラインNo.13の基準	48	120

Residual oil and iron fines measurement

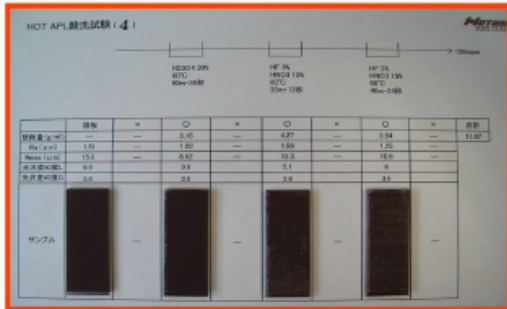
We can replicate your line condition into our test line. Evaluating the acid and brushing effects for descaling test or the cleaning effect for cleaning test is possible in the lines.



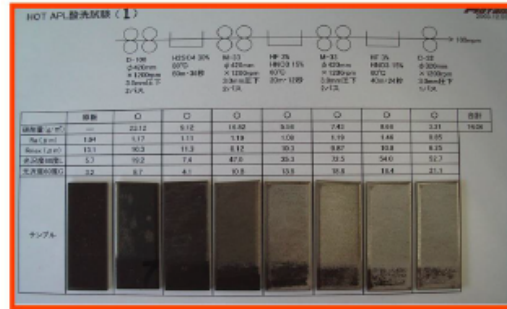
# Brush Roll

## Advanced Laboratory Facility

### b. Comparison the Descaling Result With/Without the Abrasive Brush Roll



Effect of descaling without brush roll



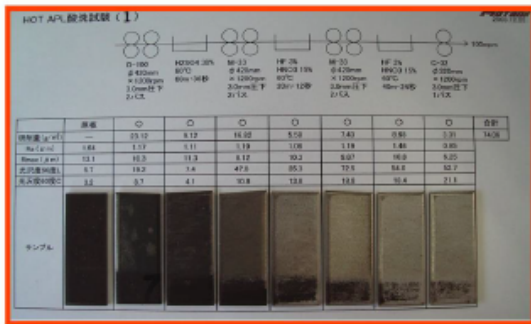
Effect of descaling with brush roll in HOTANI recommended line layout

**PICK UP !**

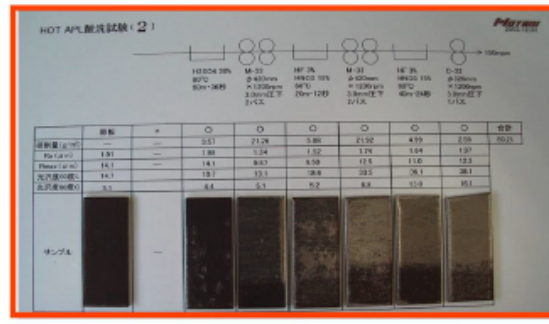
	TOTAL DESCALE(g/m <sup>2</sup> )	Ra (μm)	BRIGHTNESS
BRUSH NO USE	11.07	1.25	6.0
HOTANI PLAN	74.06	0.85	52.7

The brushing with the abrasive brush rolls helps effect of descaling dramatically even the ferritic stainless steel or high Cr-content material. Additionally, the roughness of the strip surface is improved.

### c. Effect of the Heavy Abrasive Brush Roll



With heavy abrasive brush roll (called D-100)



Without heavy abrasive brush roll(called D-100)

**PICK UP !**

	BRUSH (g/m <sup>2</sup> )	H2SO4 (g/m <sup>2</sup> )
D-100 USE	23.12	9.12
D-100 NO USE	0	3.57

The effect of sulfuric acid is improved almost three times by using the heavy abrasive brush roll (D-100) at the position prior to the first acid bath.

# Brush Roll

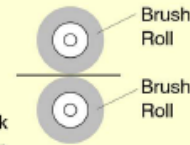
## Brush Roll Equipment for Descaling



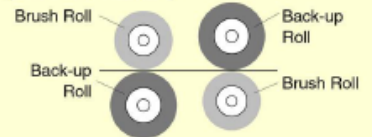
### Brush vs Brush (HOTANI)

#### Advantages

1. Small space ( 1/2 )
2. Low cost ( Installation and maintenance )
3. To prevent chatter mark because of low vibration.



### Brush vs Back-up Roll (Conventional)



### Brush vs Brush System (HOTANI)



### Brush vs Back-up Roll System



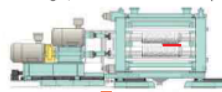
#### Optional function

##### ① Oscillation system

The system is capable of even wear of whole brush rolls. This makes the lifetime of brush rolls longer, and makes the surface quality better.



① Motor (Drive) side limit position



② Center position



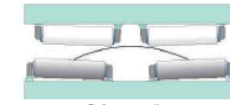
③ Work (Operator) side limit position



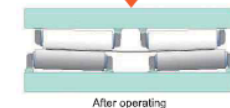
① → ② → ③ → ② Reptitive movement

##### ② C-camber correcting device

The device can correct a C-shaped strip to make it flat at the brushing position. This also makes the lifetime of brush rolls longer, and makes the surface quality better.

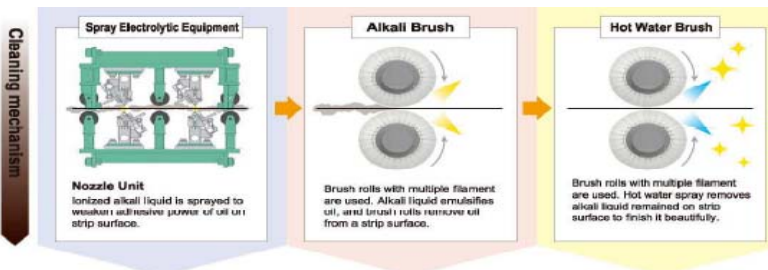
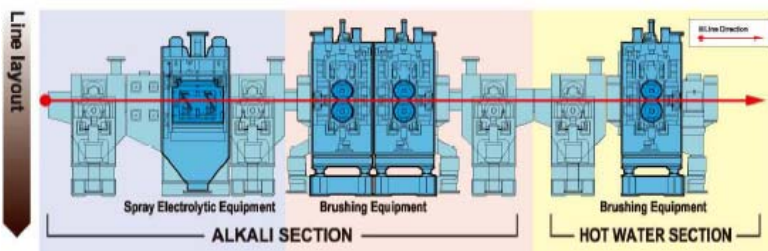


Before operating



After operating

## Brush Roll Equipment for Cleaning



### ■ CGL (Carbon Steel / Galvanizing Line)

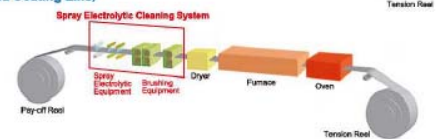


### ■ BA/CAPL (Stainless / Annealing Line)

※ Line Image is CAPL



### ■ ACL (Annealing and Coating Line)

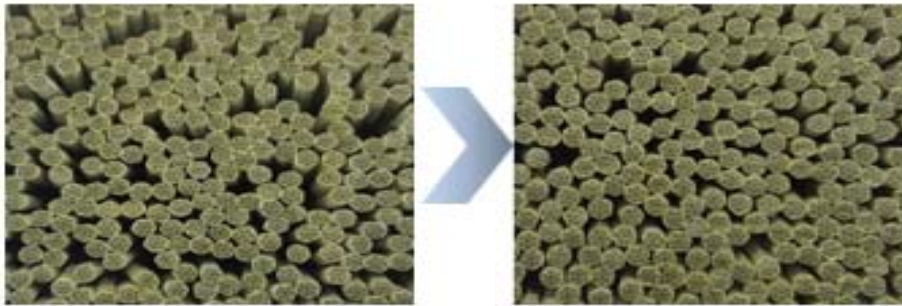


# Brush Roll

## BS Project with POSCO STS



▶ 개선된 Brush Roll 모습



▶ 모 밀도 개선 모습

브러쉬롤 품질을 향상하고자 대한동방은 브러쉬롤 모 밀도를 증가하는 방법을 포함 STS압연부에 제안했다.

일반적으로 브러쉬롤은 모 길이, 강도, 가닥수 등에 따라 연마 강도, 연삭량이 큰 차이를 보이기 때문에 기존품의 성능을 유지하면서 모 밀도를 증가하는 것은 고난도 작업이었다.

이런 환경에도 불구하고 끊임없는 연구와 포스코 과제리더와의 시도 끝에 대한동방(주)은 기존 롤브러쉬의 모 종류, 길이 등을 변경하지 않고도 모 밀도를 증가시키는데 성공한다.

그 결과 기존품 대비 롤브러쉬 평균수명이 57% 증가했으며, 모 밀도가 향상되어 표면 스케일 제거 성능 또한 증가했다.

한편, 포스코는 이번 "STS 소둔산세공장 3HAPL Heavy Brush Roll 수명연장" BS 과제수행을 통해 비용 절감 효과뿐 아니라 코일 미산세로 인한 지연시간 단축에도 긍정적인 효과가 있을 것으로 기대된다.

# Brush Roll

## Water Spray 관련

### 1) Spray Water의 목적

- a) 피세정물의 표면 오염을 잘 떨어지도록 합니다.
- b) Brush Roll이 Brushing한 오염을 씻어내며 피세정물의 재오염을 막고 Bristle의 오염을 막아줍니다.
- c) Brushing으로 생긴 마찰열을 냉각시켜 줍니다.

### 2) Spray Water의 수온

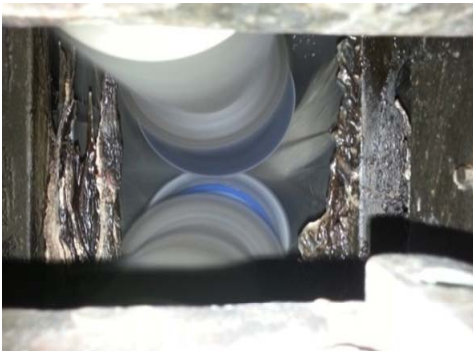
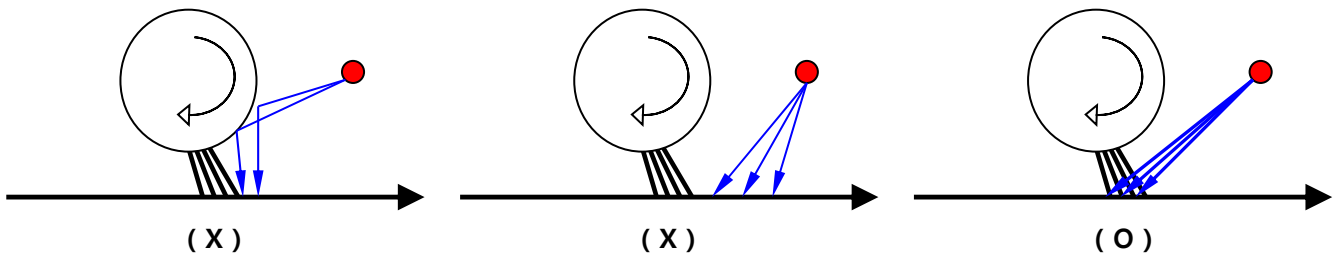
일반적으로 수온이 높을수록 오염을 씻어내는 효과는 크나, 마찰열에 대한 냉각효과는 낮아지게 되어 Bristle의 노화를 촉진하는 원인이 되기도 하며, 합성수지계 Bristle(P.P, Nylon)에 있어서는 탄성이 떨어져 Brushing효과가 매우 낮아집니다.  
이런 점에서 Spray Water의 온도가 높은 Line에서는 Bristle이나 Spray 방법 선정에서 주의가 필요합니다.

### 3) Spray Water의 수량

세정 및 냉각효과 등을 감안한다면 수량은 많을수록 좋다고 할 수 있겠지만  
대략적으로 Brush Roll Face 100mm당 5L/分 이상의 수량은 확보할 것을 권합니다.  
또한 Spray Nozzle 막힘 등을 감안하여 수압계와 유량계를 설치하여 점검하실 것을 권해 드립니다.

### 4) Spray Water 분사각도

피세정물과 Brush Roll의 접촉점에 분사수가 도달하도록 하여 주십시오.  
Brush Roll에 직접 분사하게 되면 Bristle을 상하게 하거나 Bristle의 탄성과 진동에 영향을 주므로  
세정 및 연마 효과가 낮아지거나 불균형을 일으키게 됩니다.



# Brush Roll

## Water Spray 관련

### 6) Inter-Cooling Type

Brush Roll의 무부하측 단에 Rotary Joint를 취부하여 Shaft 내부에 Water를 보내어 내부에서 Roll 표면으로 분사하는 방법이며, 냉각수가 Brush Roll을 통하여 Strip으로 가기 때문에 Brush Roll의 냉각효율을 높일 수 있는 방법이 됩니다. 외부 Spray 방법과 혼용하여 사용하시면 최고의 성능을 발휘할 수 있습니다.

또한 내부 Spreading plate를 적용시킴으로써 보다 균일한 내부 Spray를 구현할 수 있습니다.

#### 장점

- a) Brush 오염이 적음 - Water가 내부의 이물질을 배출해 줍니다.
- b) 장수명 구현 - Bristle의 허리부를 냉각 시키므로 Bristle의 반복응력에 의한 절손 방지효과가 있습니다.

#### 주의점

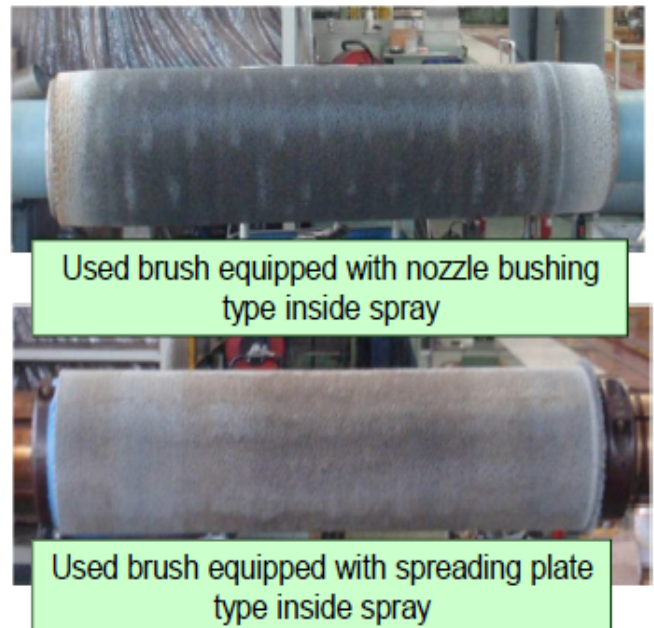
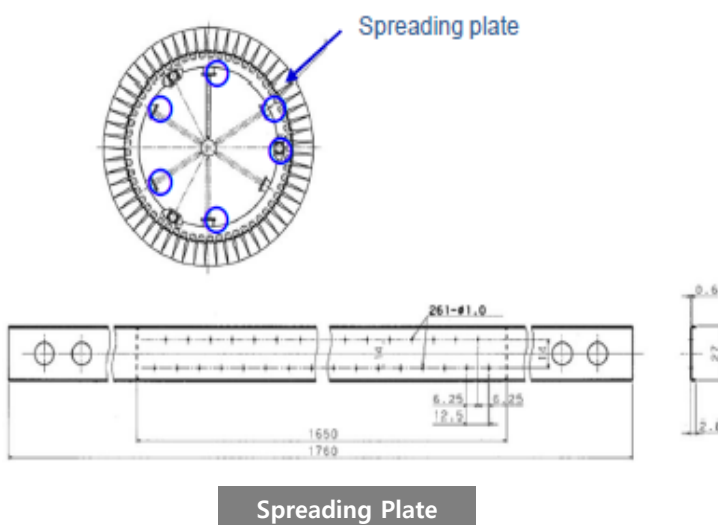
##### a) 수질 관리 철저

Shaft내부에 통수되므로 수질이 오염된 상태에서는 Shaft내에 이물질이 누적되어 통수를 막게 됩니다. 또한 Brush Roll의 Bristle 사이에도 이물질이 누적 되므로 세정 및 연마 효과가 낮아지며 Bristle의 수명 단축의 원인이 됩니다.

##### b) 수온

Bristle의 마찰열을 흡수한 Water가 Strip에 도달하게 되므로 외부 Spray Water보다 수온을 낮게 사용하심을 권합니다.

### k. High Accuracy Inside Spray against Heat Storage



# Brush Roll

## Brush Roll 고객사



### 국내

#### Carbon Steel

POSCO 포항제철소  
POSCO 광양제철소  
POSCO 강판

#### Stainless Steel

POSCO 포항제철소  
POSCO International(안산)

#### 해외 Carbon Steel

POSCO-Guangdong  
POSCO-TCS  
POSCO-Maharashtra  
POSCO-Mexico

#### 해외 Stainless Steel

PZSS  
QPSS  
POSCO-VST  
POSCO-Thainox  
POSCO-ASSAN-TST



### Carbon Steel

현대제철 당진  
현대제철 순천

### Stainless Steel

현대비앤지스틸  
현대제철 인천



### Carbon Steel

동국제강 부산공장  
동국산업 포항공장  
한금, 나스텍

### 그 외 국내 고객사



### 그 외 고객사 다수

# Technical Information for Brush Roll



## **KRST**® 대한동방주식회사

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