

"De-pickling" and "De-bonderizing"  
with even further production cost reductions.



# Five times longer die life

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in cold forging.

## Cold Forging Pre-Treatment "WLS"

Wet blasting and one-liquid lubricant application system

Everything from the removal of black oxide to the bonderizing  
alternative process is done in this one small unit.



## Wet blast / single liquid lubricant application

**Cold-forging pre-treatment that gives you five times longer die life**

# WLS

### What is "WLS"?

WLS is an abbreviation for "Wet blast/1-liquid lubricant application (Wetblast Lubricant System)."

Our proprietary technology integrates degreasing, black scale (oxide scale) removal and lubrication treatment for the cold forging process.

Two processes are combined into a single unit: the surface processing using wet blasting, and the lubrication process using a single-liquid lubricant.

Furthermore, compared to conventional bonderizing equipment, this is a revolutionary system that realizes surprising cost reductions with less than 1/10 of the installation area, 1/30 of the water used, and 1/20 of the amount of industrial waste produced.

### WLS Advantages

#### Die Life Improvement

The actual improvement of die life is more than 5 times that of conventional methods. This is because wet blasting is used to maximize the lubricating performance of the one-liquid lubrication coating.

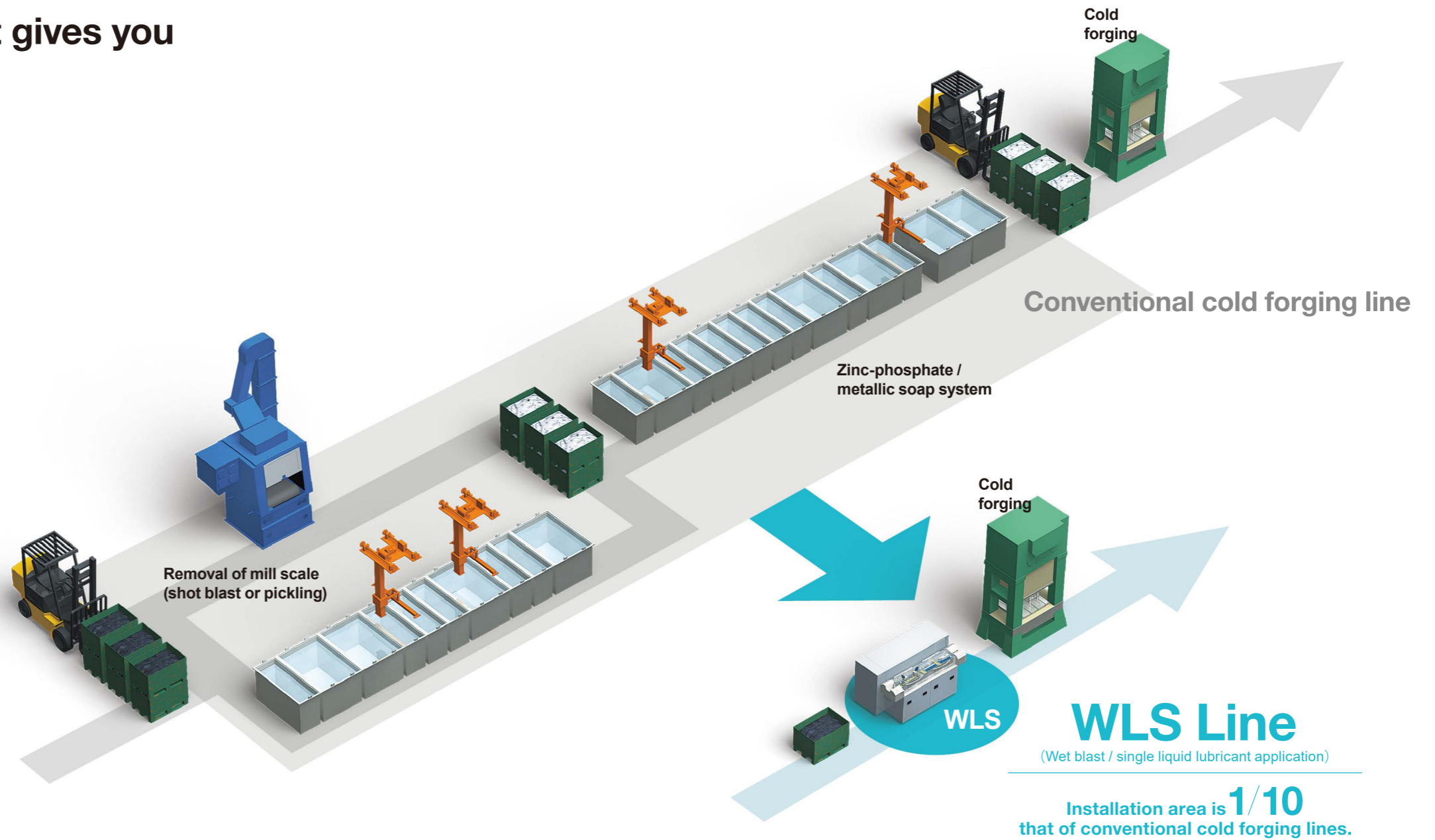
#### Cost Reductions

The heavy and lengthy lubrication process can be greatly simplified.

Because lubrication is done by spraying, the only daily maintenance is the replenishment of abrasives and lubricants.

#### Environmental Impact Reduction

It completely replaces the bonderizing process, which has a high environmental impact. Compared to bonderizing, reactive sludge is zero and waste can be reduced by 90% or more.



Conventional cold forging line

Zinc-phosphate / metallic soap system

Removal of mill scale (shot blast or pickling)

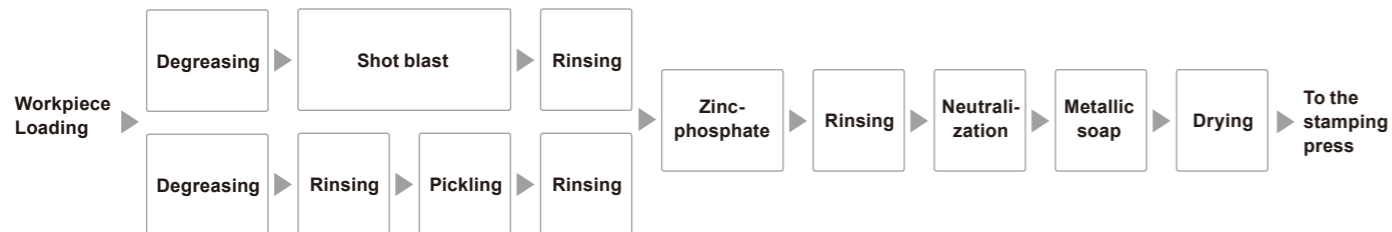
WLS

**WLS Line**

(Wet blast / single liquid lubricant application)

Installation area is **1/10** that of conventional cold forging lines.

### Conventional cold forging line

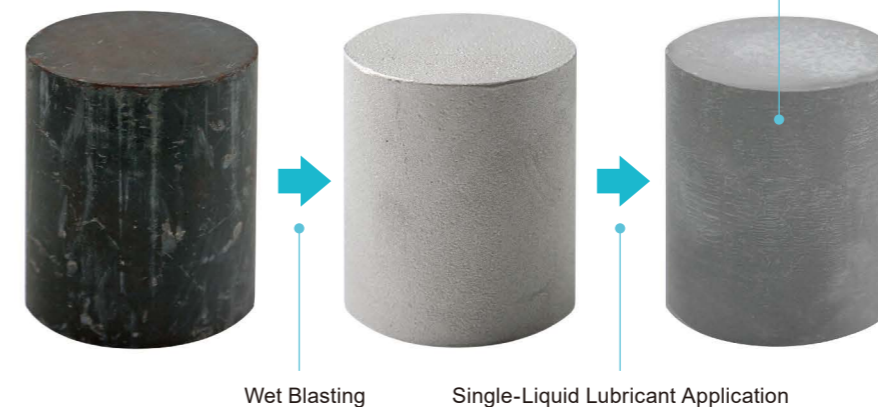


### WLS Line



### Thin and Uniform Lubricant Application

#### Smooth Film Surface Free From Roughness and Lumps



The WLS system uses a "spray application method" that prevents unevenness and lumps in the application of single-liquid lubricant, forming a thin and uniform single-liquid lubricating film.

Since the undiluted solution is sprayed as it is, there is no need for time-consuming bath preparation, and it is easy to control the amount of spray to obtain the optimum adhesion weight for the workpiece and processing.

In addition, the liquid replacement is as easy as you only need to replace a bottle, and there is no troublesome management like conventional chemical liquid treatments.

# Cold-Forging pretreatment "WLS" that increases die life by five times

The industry's long-awaited "de-pickling" and "de-bonderizing" are realized.

## Advantages

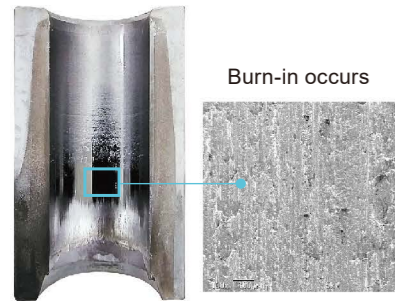
The combination of "surface preparation by wet blasting" + "single-liquid lubricant" provides lubrication superior to bonderizing.

The substrate formed by wet blasting using grit media enhances the performance of the single-liquid lubricants and gives the workpiece a lubricating property superior to that of bonderizing.

### Ball Pass-Through Test

Max. load comparison between bonderizing and WLS

Bonderized Part

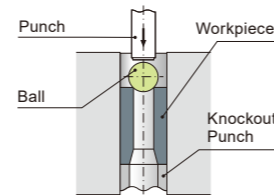


WLS Processed Part



	Bonderized Part	WLS Processed Part
Maximum Load (kN)	189.5	119.9
Burn-in	With burn-in	No burn-in

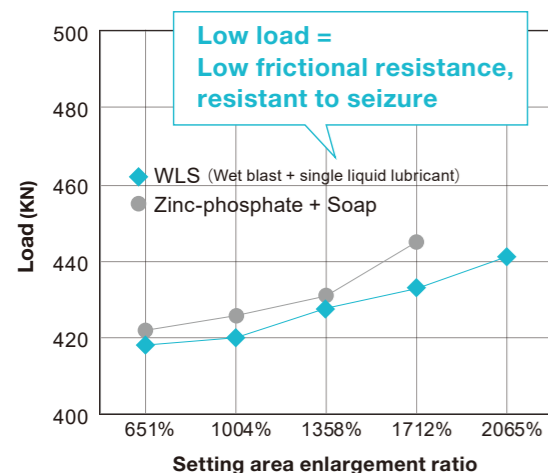
It is a test in which a ball slightly larger than the inner diameter of the cylindrical workpiece to be tested is pushed into the test piece using a punch, and the load is measured in order to measure the lubrication performance.



※Ball Pass-Through Test  
Test cooperation: Nagoya Institute of Technology

### Rear extrusion test

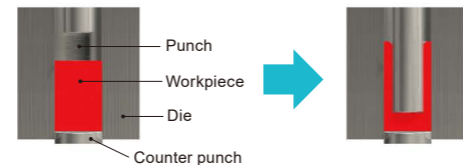
Comparison of forging load between bonderizing and WLS



With WLS, wet blasting is used in the surface preparation process as the pretreatment of the lubrication process. Wet blasting creates a fine roughness maximizing the effect of single-liquid lubricants, which were not sufficiently brought out with conventional methods. It has been confirmed that the lubricating film obtained through this pretreatment has high adhesion, has lubricating performance that surpasses that of bonderizing, suppresses seizures, and extends the life of the die by up to five times.

#### Test conditions

Test speed 35spm  
Punch HAP72  
Workpiece S10C spheroidizing annealed material  
Workpiece / liquid temperature Room temperature



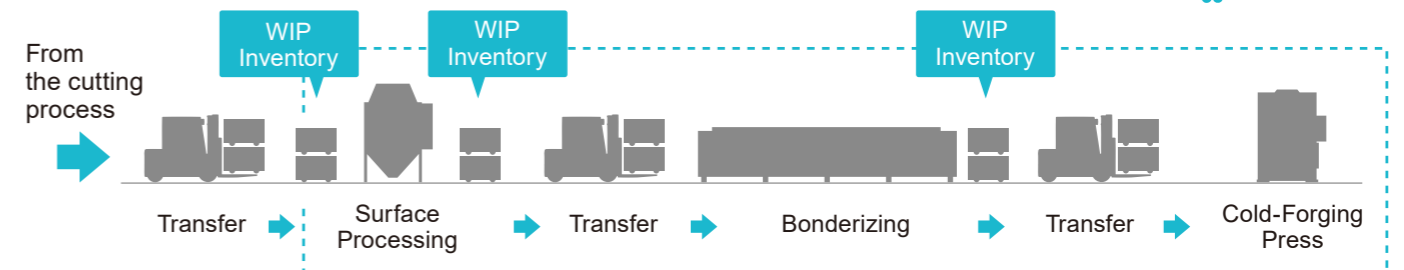
# Shortening of the production process gives you labor savings and reduction in production costs.

Line integration is done by a simple process

Realizes process shortening and cost reductions by consolidating the surface treatment and lubrication processes into a small unit with a length of 2.5 meters.

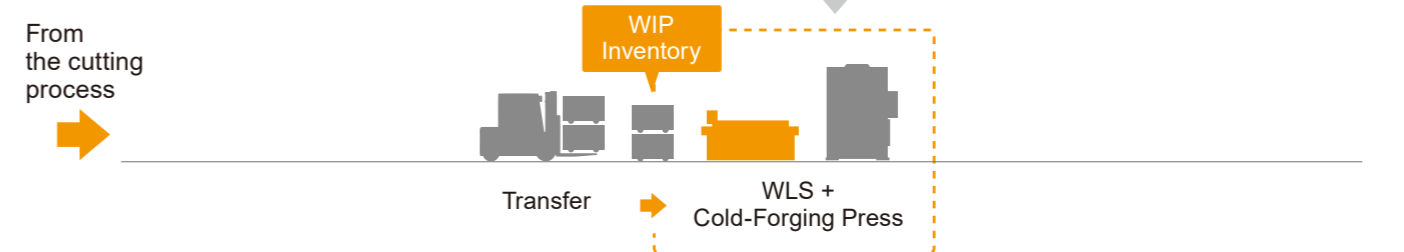
## Bonderizing Process

Person icon × 7



## WLS Process

Person icon × 3



## Bonderizing and WLS Comparison

WIP Inventory

67% Reduction

Bonderizing = 6 shifts  
WLS = 2 shifts

Number of Workers

57% Reduction

Bonderizing = 7 workers  
WLS = 3 workers

Lubricant Cost

36% Reduction

Bonderizing = ¥2.5 per piece  
WLS = ¥1.6 per piece

## Equipment Example

Equipment for cold forging lines and billets

# VD-T008





# 9.3 tons of CO2 can be reduced annually

Working to promote carbon neutrality

Compared to the conventional bonderizing process, the need for shot blasting the part surface and forklifts for transporting the containers is eliminated, which reduces CO2 emissions by 9.3 tons per year and 87 kilowatts of electricity consumption per day.

## Annual CO2 Emissions

Bonderizing Process **66.8t** → WLS Process **57.7t**

Switching to the WLS process can reduce **9.3 tons** annually.

## Daily power consumption (kWh/day)

Item	Bonderizing Process	WLS Process
Lubrication	505	538
Surface Treatment (Shot Blasting) *1	100	—
Forklifts *2	20.4	—
Total	625.4	538.4

Can save **87 kWh** every day.

\*1 Shot Blasting Prerequisites ※Lubrication conditions are based on Daido Chemical's calculations.  
 12000pcs/day=6000kg/day  
 Shot Blasting Power Consumption : 10kW  
 (apron shot: 5.5 kW impeller + exhaust + apron drive)  
 200 kg per batch: 20 min per batch + 5 min for replacement  
 30 times per day  
 30 times x 25 min + 60 min = 12.5 hours ⇒ Shot Blasting (2 units):15 times x 20 min operation per day

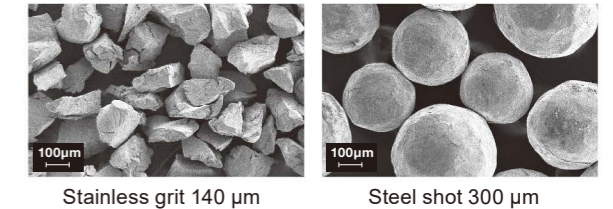
\*2 Prerequisites for forklifts  
 Forklift capacitance is 20 kW (10 kW each for driving and cargo handling).  
 Container capacity: Shot Blasting 400 pieces, Bonderizing 800 pieces, averaging 600 pieces  
 Transportation time per one operation is 3 minutes.

# Water-based one-step type lubricant realizes strong processing.

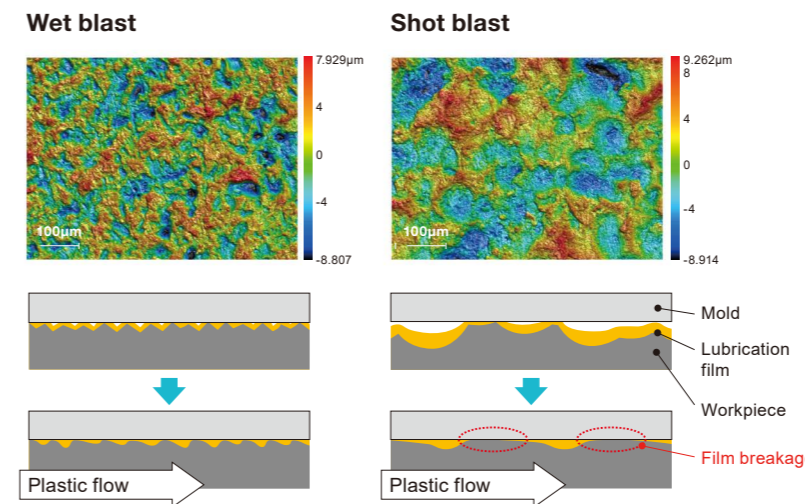
Key points of surface treatment to improve lubrication performance

## Pretreatment conditions and blasting media

Pretreatment	Media type	Shape	Average diameter(μm)
Wet blast	Stainless grit	Angular	140
Shot blast	Steel shot	Spherical	300



## Prevention of film breakage by micro-pool formation



The narrow and deep uneven surface formed by wet blasting gives you stable coverage of the lubricant, thus suppressing film breakage of the single-liquid lubricant on the expanded surface due to forging.

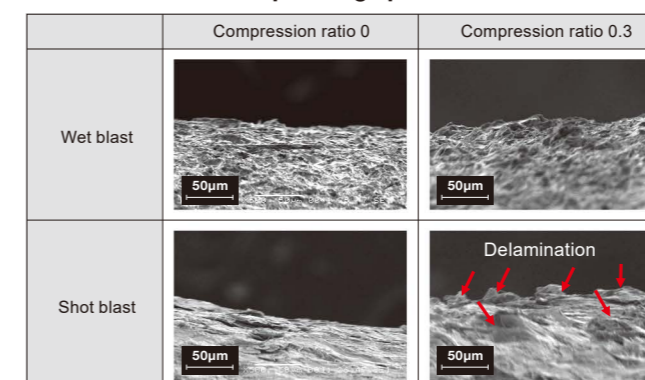
1. Fine irregularities are formed on the workpiece, which improve the adhesion and retention of the lubricating film.
2. In addition, the fine unevenness serves as a source of countless lubricating components, which coats and protects the new surface.

## Suppression of delamination

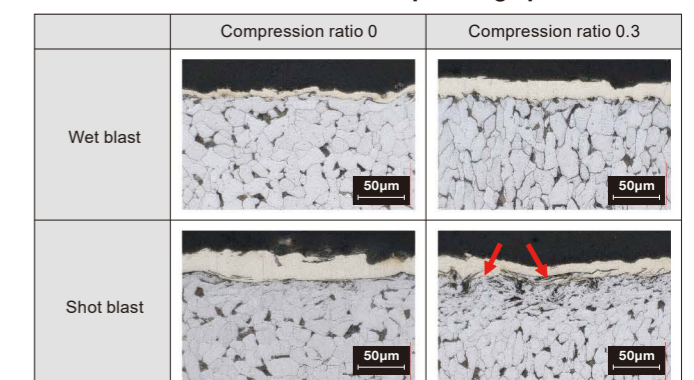
**Test conditions**  
 Workpiece S10C S.A.  
 size 15mm×10mm

The specimen was compressed to 70% by applying pressure to both the right and left sides, and the surface and cross-section were observed.

### SEM observation of upsetting specimens



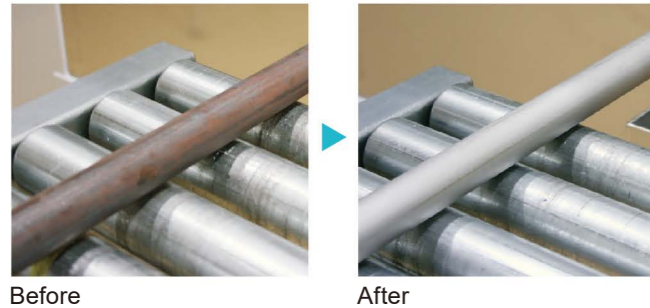
### Cross-sectional observation of upsetting specimens



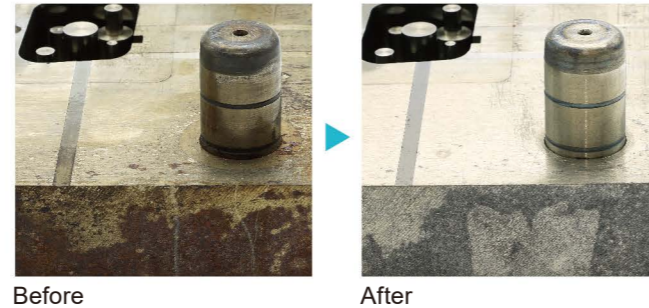
# Wet Blasting Processing Examples

Wet blasting can perform various surface processing and modifications depending on the abrasive selected and without using any chemicals.

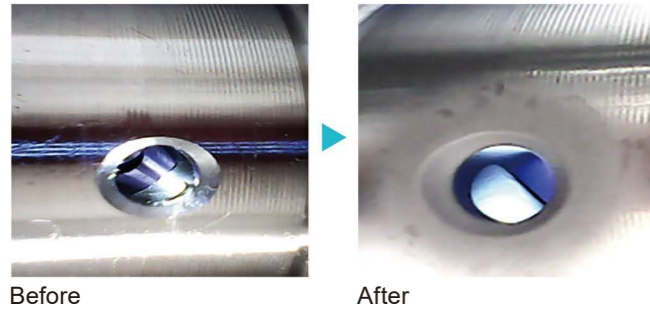
## Removal of oxide scale from steel bars



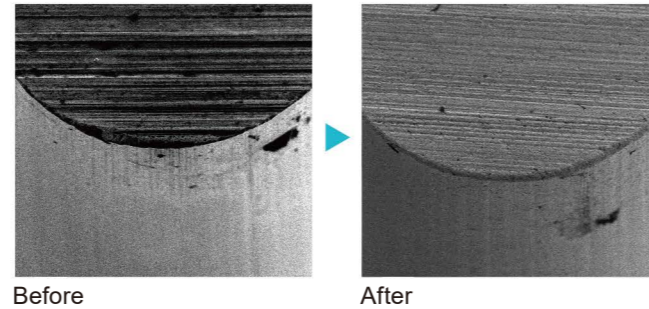
## Die Cleaning



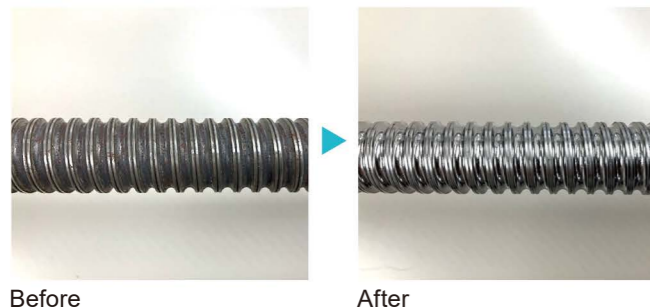
## Crankshaft Deburring



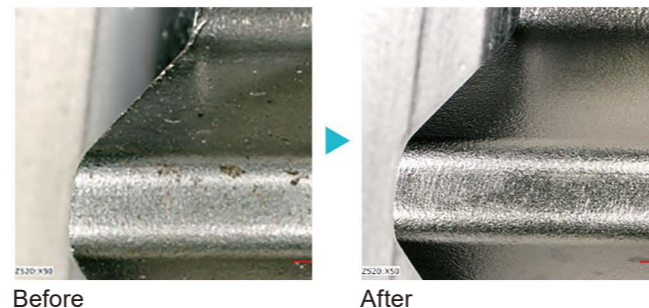
## Edge honing of cutting tools



## Ball screw descaling and surfacing polishing



## Deburring and coating pretreatment of hob cutters.



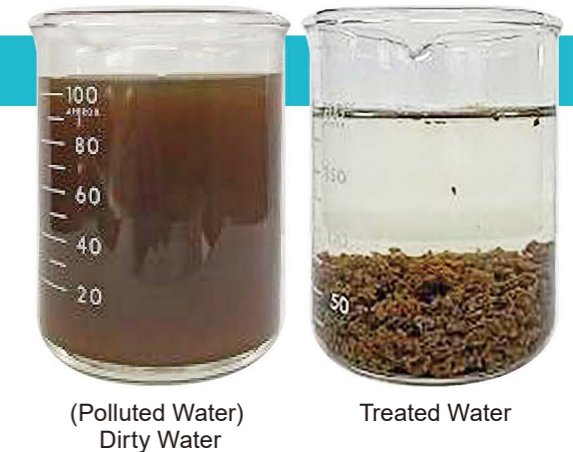
# Closed system that does not require water replacement for a long period of time

Water quality improvement equipment that stabilizes the rinsing quality by making the rinse water cleaner

## Features

- ▶ Cost reductions are possible by recycling the rinse water.
- ▶ Stabilization of workpiece quality by maintaining the rinse level
- ▶ Reduces man hours for regular maintenance.
- ▶ Able to filter waste liquids containing abrasive sludge and single-part liquids.

\*From Tohoku Special Steel's actual results



## Differences with the sludge collection units

	Sludge Collection Unit	Water quality improvement equipment
Purpose	Stable blasting quality	Improvement of rinse water's water quality
Sections Used	Blast Tank	Rinse Tank
Method	Settling type, Magnetic type, etc.	Coagulation Settling Type
Average processing flow rate (L/min)	2-150	0.2



## Running Cost Example

\*Once per day (25 days): When the 100 liters of water of the second rinse tank is completely replaced.

### Gathering Contractors

Item	Cost (monthly)
Transaction Cost	¥325,000
<b>Total</b>	<b>¥325,000</b>

### Water quality improvement equipment

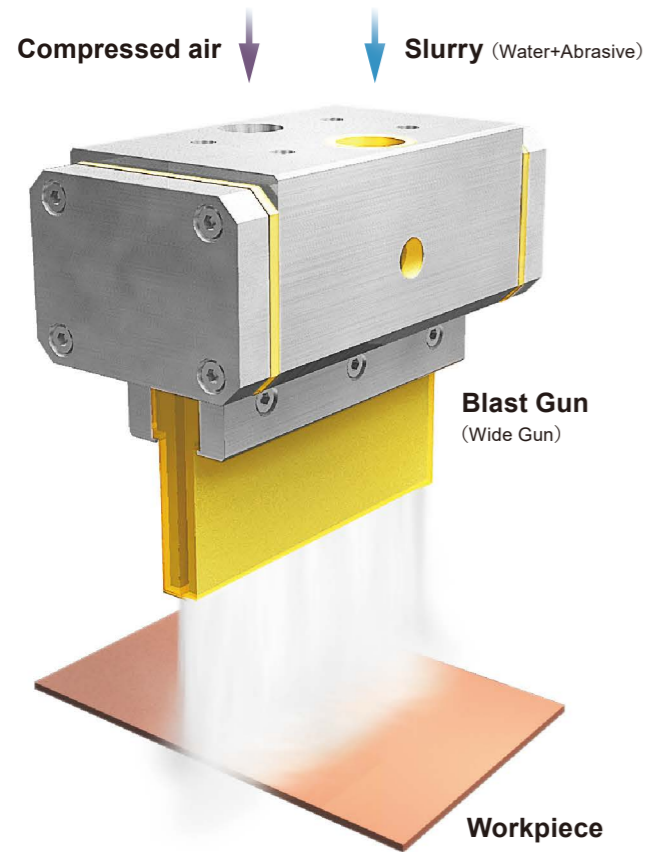
Item	Cost (monthly)
Flocculant Cost	¥4,500
Flocculant Disposal Cost	¥26,000
Filter Cloth Cost	¥1,000
<b>Total</b>	<b>¥31,500</b>

**¥293,500 per month reduction possible**



# What is wet blasting?

Wet blasting is a technique to project a mixture of abrasive and water at high speed with compressed air against a material such as metal, plastic, or ceramic to clean, process, and modify its surfaces.



## Features of Technologies

1. The processing force can be flexibly controlled.
2. The high reproducibility of the processed surface ensures stable quality.
3. Fine particles of several micrometers can be used, resulting in more precise processing.
4. Compatible with any material since it is a physical processing method.

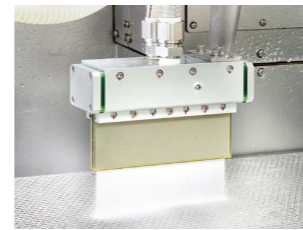
## Features of Equipment

1. Easy daily equipment management Slurry concentration control only.
2. No heat or static electricity is generated.
3. No dust is generated.
4. Excellent equipment durability.



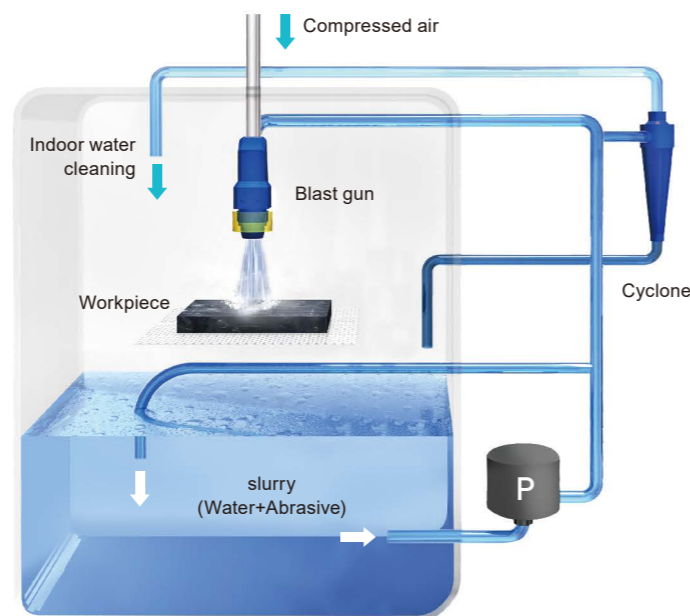
Click here for details →

<https://www.macoho.com/wetblast.html>



# Basic system

1. It can reduce waste and wastewater by recycling slurry and can also operate as a closed system.
2. Only slurry concentration (abrasive volume) control is required on a daily basis, and automatic control is also available.
3. In wastewater treatment, suspended solids (worn particles and shavings) are classified and removed.
4. No dust is generated due to the wet processing and equipment structure.
5. This system uses many urethane rubber parts manufactured by Macohowhich provide high durability.
6. Secondary treatment is possible by adding a rust-proof agent\* or a degreaser.



\*Wet blasting using slurry with a rust-proof agent is Macoho's patented technology.

# Various usages in a wide variety of industries Main usages of Wetblast

## Automobiles

### Treatment before adhering anti-vibration rubber having metal fittings

- Increases adhesion strength and surface treatment for rust-preventive film
- Fine and even phosphate film generation
- Removes oil, cleans and roughens the surface all in one process



## Automobiles

### Treatment before forging plastic parts

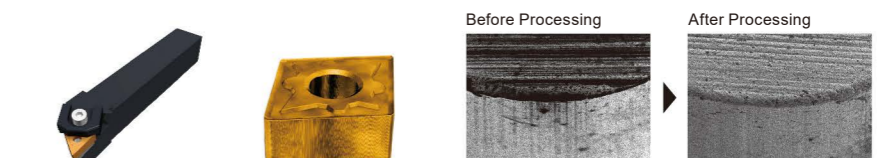
- Removes scales as pre-forging treatment
- Optimal surface formation for 1 liquid lubricant application
- Removes scales, roughens and lubricates the surface all in one process



## Tools

### Honing blade tips of carbide chips

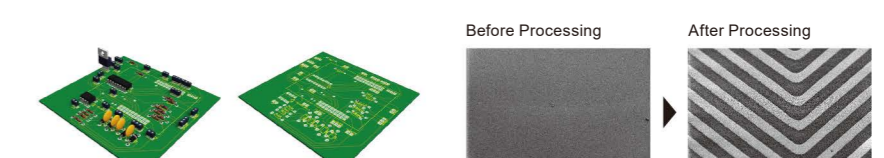
- Deburring and rounding to prevent a nicked edge
- Removes foreign substances to improve coating adhesion
- Improves slipperiness of coating



## Electronic parts

### Physical etching of substrates

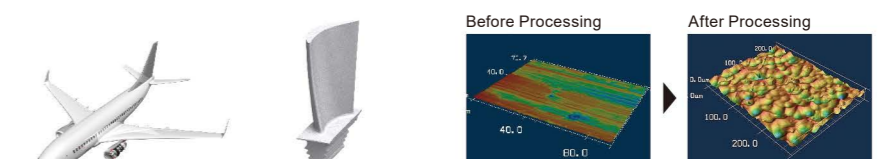
- Grinds resin to expose built-in parts and connection points
- Removes spreading powder to form a surface optimal for metallization
- Improves metal plating adhesion and underfill filling



## Aircrafts

### Turbine blade peening [Improvements to fatigue strength]

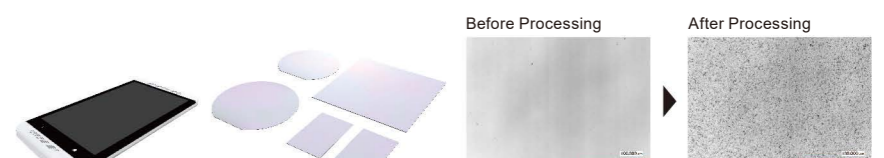
- Applies stress to improve fatigue strength
- Even stress application with our original wide gun
- More efficient and less costly than conventional methods



## Glass

### Roughening the surface of display glass

- Reduces reflection rate while maintaining permeability
- Precise control of size and amount of traces
- Improvement to coating adhesion



## Vehicle restoration

### Cleaning and surface finishing of automobiles and motorcycles

- Removes impurities such as oil, rust and carbon to restore parts
- Simultaneous cleaning and finishing
- A clean and shining surface like new



## Equipment Example

Equipment for cold forging lines and billets

# VD-T008

Wide Gun: 90x2.5mm (2 guns) Full automatic

Thrust transfer method Rinse

1-Liquid Lubricant Application Drying

Iron powder recovery option

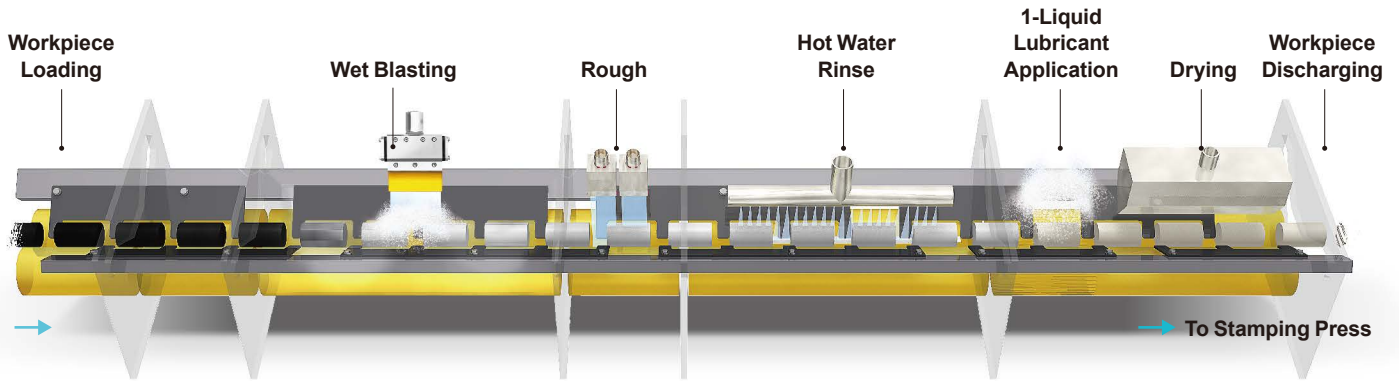
Dimensions	3493(W)×1685(D)×2009(H)mm
Target Part	Billet Material
	Diameter: φ20 ~ 40 mm
	Length: 20 ~ 85 mm
Blast Gun	Wide Gun: 90 x 2.5 mm (2 guns)
Power Supply	AC200V, 50/60Hz, 3-phase
Air Consumption	5.0 m <sup>3</sup> /min (when NTP and blast air pressure is 0.4 MPa)



This equipment automatically performs everything from the surface processing of materials to the lubricant application for the cold forging process. By directly connecting to the stamping press, it is possible to integrate the three processes of surface processing, lubrication process, and stamping. Its main features are its thrust transfer and spray application method.

## Unit details and features

Length is 2.5 meters / 20 ~ 36 spm



Surface processing and lubrication process are integrated into one unit 2.5 meters in length.

Wet blasting has integrated the surface processing and lubrication process into one small unit that is 2.5 meters in length.

Thrust transfer method does not cause scratches or dents

There are no scratches or dents caused by collisions between workpieces, which often occur in mass processing such as with belt tumblers.

Directly connecting to the stamping press maximizes production efficiency.

Compact design suitable for integrating with stamping presses. Directly connecting is also recommended to maximize WLS performance.

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