

# Yuken Europe GmbH



Yuken Europe GmbH is a subsidiary of Yuken Industry. Located in the center of Japan close to the Toyota Motor Corp. HQ, Yuken Industry is a metal surface treatment products manufacturer with about 300 employees. Originally founded as a home-use soap maker in 1937, Yuken later evolved into a comprehensive metal surface treatment products manufacturer. For more than half a century, we at Yuken have served numerous major international OEMs, parts manufacturers and job shops in the automotive and other industries, providing our innovative products and services worldwide. In addition to Yuken Europe GmbH, we have subsidiaries in the USA, Thailand and Mexico. We are actively engaged in sales activities and provide technical support to our customers to satisfy their ongoing needs.

Since Yuken Europe GmbH was established in Groß-Gerau, a suburb of Frankfurt, Germany in April 2018, we have strengthened our customer support and expanded sales of our localized products to new customers in the European market.

Through a strong partnership and collaboration with Italgalvano SpA, we promote localization and distribution systems for our products, and constantly enhance our technical support. As a result, we are steadily increasing our customer base for our corrosion resistant products (zinc & zinc alloy systems, zinc flake products, and topcoats for zinc/zinc alloy plating and zinc flake paint).

We understand that "environmental protection" is key for us to establish a successful and long-lasting business in Europe, considered the world leader in the environmental arena. As a pace-setting company in the manufacture of metal surface treatment products, we apply our key concepts of "Clean, Honest and Beautiful" to all of our corporate activities including the development of corporate ethics, improvement of employee training/education, and the enhancement of product and service quality, not to mention environmental protection. We continually strive to create new surface treatment technologies for our customers, to contribute to the growth of the industries we serve, and to improve the communities we so care about in Europe.



On the following pages, we are pleased to introduce the corrosion protection products that were developed in Japan.

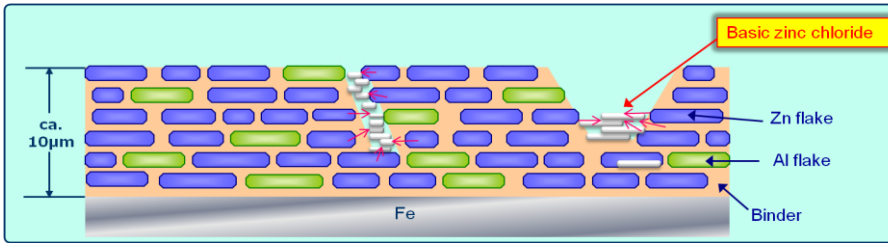


< Metasu YC, Zinc Flake Coating Series >

Market Conditions:

Zinc flake coatings are prone to failure in corrosion resistance performance when there are scratches & chips in the mass production process. Users tend to apply multiple layers to prevent uncoated pinholes. Some users expect to see sacrificial corrosion in the zinc flake coating because of zinc usage, but that expectation is often unfulfilled due to the zinc flake coating characteristics. Yuken developed a zinc flake coating system that addresses all the above issues and achieves high corrosion resistance performance with increased sacrificial corrosion resistance.

High Corrosion Resistance Mechanism



The base metal (Fe) is protected from corrosion as insoluble and highly protective basic zinc chloride is developed during the initial period of corrosion in a corrosive environment.

In the early stages, a portion of this metal coating film dissolves and forms basic zinc chloride/basic zinc carbonate over the top surface of the film. This is the reason why consistent corrosion resistance can be achieved despite the presence of scratched surfaces.

Corrosion Resistance Test with Mass-Produced Bolts after Multiple Fastenings (Effective Areas: Heads & Thread Areas)

	Yuken's Older Basecoat (2 layers) +Topcoat (1 layer) Coating Weight: Basecoat 30g/m <sup>2</sup> , Topcoat 3g/m <sup>2</sup>	Yuken's Current Basecoat (2 layers) Only Coating Weight: Basecoat 30g/m <sup>2</sup>
0h		
1500hrs.		
2500hrs.		

Part: M10 Bolt  
Basket Diameter: 600 mm  
Processed Volume: 50 kg

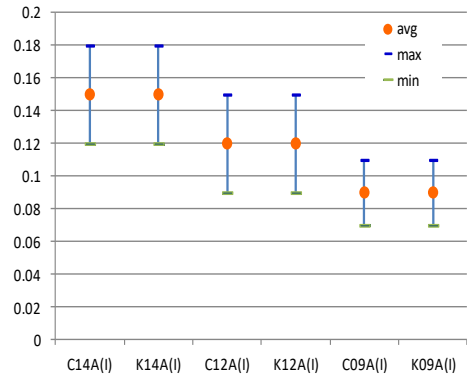
Fastening Torque: 82N · m  
Number of fastening times: 3  
Salt Spray: Per JIS Z-2371

Bolt heads tightened with an impact wrench a few times are likely to have chips or damaged film. When a corrosion evaluation is performed on parts going through this multiple fastening/loosening after they are processed with a normal zinc flake coating and a topcoat relatively good for wear and damage resistance, those parts do not reach 1500 hrs. (Japanese OEM spec). Yuken's zinc flake coating system does reach more than 1,500 hrs. with just our basecoat (2 layers). This is because the generated white byproduct (basic zinc chloride and basic zinc carbonate) covers the damaged areas, slowing the corrosion process. In addition, corrosion is not likely to extend horizontally, and this results in firm control of red rust generation, enabling consistent mass production results.

<Metasu Lubrus Topcoat Series - Versatile Sealers for Zinc/Zinc Alloy Plating and for Zinc Flake Coatings>

1. Friction Coefficient Ranges of Metasu Lubrus Topcoats

LUBRUS Topcoat	Characteristics	Type	Organic/ Inorganic/Hybrid
C14A(I) clear	Repeated fastening stability, hi,corr,resistance	Water base	Organic
K14A(I) black			
C12A(I) clear			
K12A(I) black			
C09A(I) clear			
K09A(I) black			



There are 2 major functions required for topcoats in the market: friction stability and corrosion resistance improvement. We can meet any OEM's friction coefficient requirements by adjusting in 1/100 increments.

Even after multiple times of fastening & loosening, readings are consistent at 0.2 or below in the friction coefficient measurements. When processing with our topcoat over zinc plating or zinc flake coating, friction stability can be achieved regardless of use of steel, Al or e-coated plate. In the case of zinc nickel, however, the friction coefficient is likely to increase with the Al plate. Even in that case, the increase in friction coefficient can be reduced by changing the topcoat type.

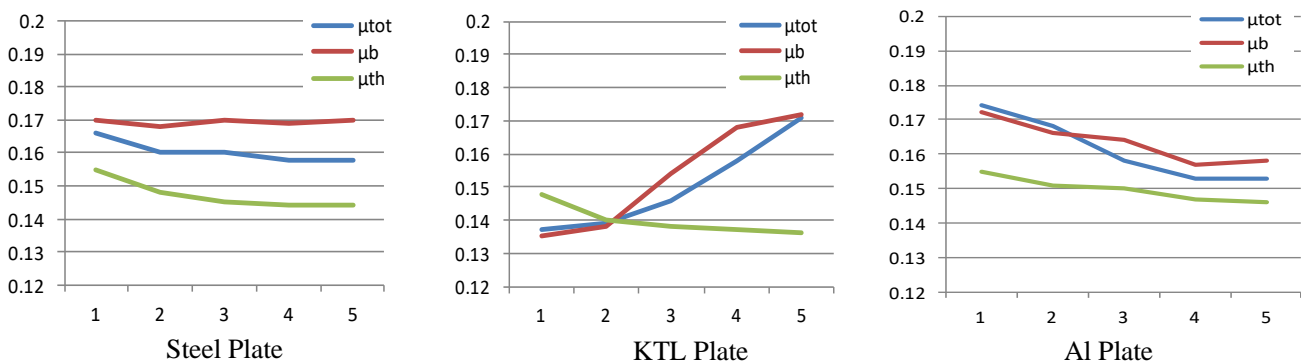
2. Corrosion Resistance Performance of Metasu Lubrus Topcoats

CCT (Cyclic Corrosion Test)	Topcoat C-14/K-14 Over Zinc Plating				CCT	Topcoat C-14/K-14 Over Zinc Nickel Plating			
	C-14 weight		K-14 weight			C-14 weight		K-14 weight	
	15mg/dm2	20mg/dm2	30mg/dm2	40mg/dm2		15mg/dm2	20mg/dm2	30mg/dm2	40mg/dm2
10 cycles	[Image: Zinc Plating, 10 cycles]				10 cycles	[Image: Zinc Nickel Plating, 10 cycles]			
30 cycles	[Image: Zinc Plating, 30 cycles]				50 cycles	[Image: Zinc Nickel Plating, 50 cycles]			
50 cycles	[Image: Zinc Plating, 50 cycles]				90 cycles	[Image: Zinc Nickel Plating, 90 cycles]			

One Cycle of CCT: Salt Spray, 50°C, 4hrs. → Dry, 70°C, 5hrs. → 95% Humidity, 50°C, 12hrs. → Dry, 70°C, 2hrs. → Natural Dry, 25°C, 1hr.

3. LUBRUS Fastening Performance

(VDA Measurements: Black passivation over Zn plating, 200 rpm x 1 time followed by 20 rpm x 5 times)



The above shows VDA measurement results for our topcoat LUBRUS K14. The friction coefficients are slightly high because of the high speed fastening. However, the results show stability even with repeated fastenings. The organic functional groups in the topcoat establish powerful bonding, resulting in excellent adhesion. This topcoat is available for the EU market.

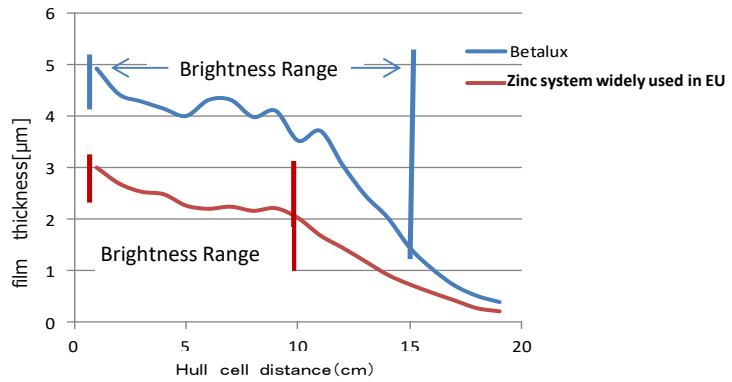
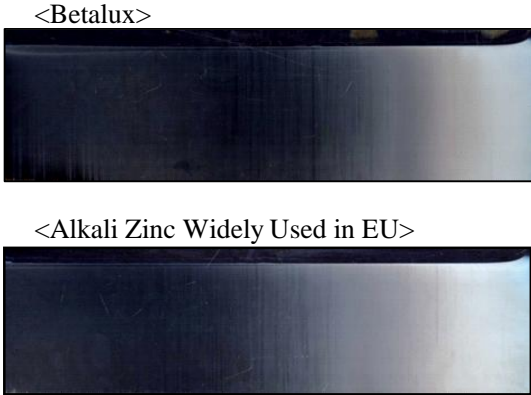
< Betalux and Wonder Series – Localized Versions of Yuken’s Alkali Zinc System and Passivation >

EU Market Deployment

It would be difficult to import large volumes of chemicals from outside the EU due to REACH. Therefore, it is essential to localize our products in order to provide our technologies in the EU. Our alkali zinc and zinc nickel systems and corresponding passivation products are readily available in the EU market. Here are the characteristics of these systems.

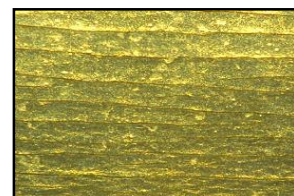
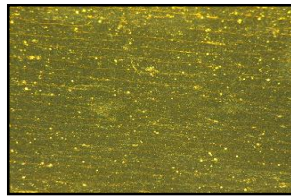
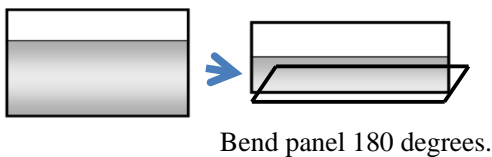
Betalux (Alkali Zinc System)

1. Bright Covering Power (20cm Hull Cell Test with 1A, 10 min, 25°C)



The bright covering power and film thickness uniformity are shown in the above photos and graph. The Zn/NaOH concentrations are 10g/120g/L. Compared to the conventional alkali zinc system in EU, the brightness region is largely extended in the low current density area. Betalux readily gives parts with complex configurations a uniform bright surface. As shown above, the deposition efficiency is high compared to the EU zinc system, and the necessary film thickness can be obtained in a shorter period of time.

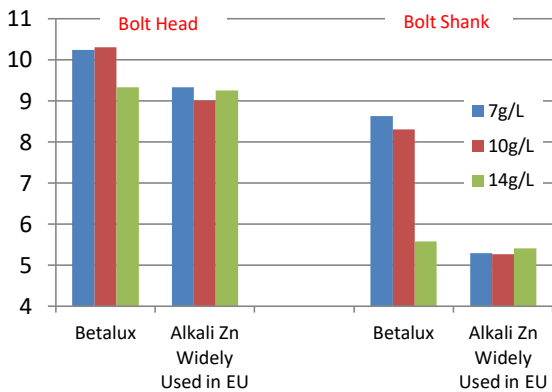
2. Ductility (Bending Test for Crack Generation)



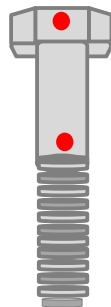
<Betalux>

<Alkali Zn Widely Used in EU>

3. Zn Concentration and Plating Deposition



Measurement Pts.



Betalux achieves high deposition efficiency even with low Zn levels. Optimal Zn level: 7 - 12 g/L.

Lower Zn concentration results in reduced metal cost.

Compared to the widely used system, Betalux provides more uniform covering power.

Betalux creates a very bright smooth film. When the film is bent, crack widths are fine and narrow, exhibiting excellent ductility. Film brightness and ductility are factors not normally compatible with each other, but Betalux is an alkali zinc system which provides both qualities.

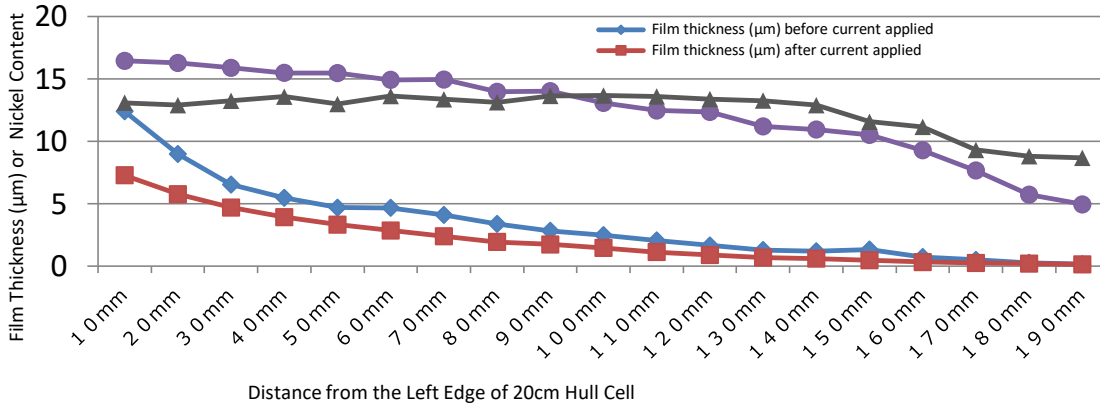
The bath temperature range extends up to 35°C, a wider process window compared to the conventional alkali bath. This is a new alkali zinc system which deposits an acid-bath-like bright surface with high deposition efficiency and also demonstrates alkali-bath-type uniformity and covering power. Betalux is available in the EU.



<Shedar 30 and Wonder Series - Localized Versions of Yuken's Zinc Nickel System and Passivation>

1. Bath Makeup Parameters and Aging Test for Shedar 30 Zinc Nickel System

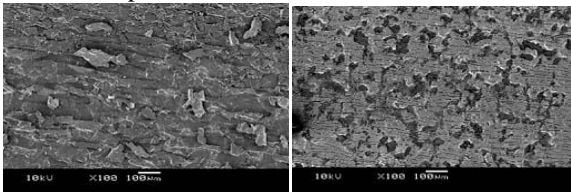
Product	Usage	Concentration	Replenishment
Zinc / NaOH		8g/L / 130g/L	
Shedar 30MD	Complexing Agent	50ml/L	1.5-2.5 L/KA - H
Shedar 30N	Nickel Solution	10ml/L	0.75-1.25 L/KA - H
Shedar 30G	Brightener	1.6ml/L	0.15-0.4 L/KA - H
Shedar 30SR	Carrier	10ml/L	0.05-0.2 L/KA - H
Shedar 30R	Hard Water Softener	5ml/L	0.04 L/1 kg of NaOH



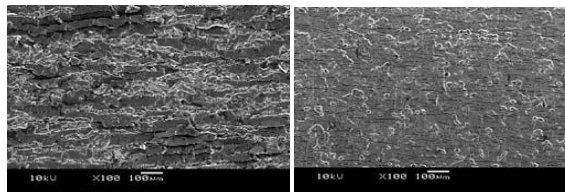
Hull Cell Plating Condition: 2A, 20 min., 25°C (Current Applied for Aging: 150A H/L)

The deposition efficiency of Shadar 30 slightly declines as current is applied for aging, but it demonstrates superior uniformity. Shadar 30 can therefore provide a consistent process for the user, as it can control brightness deterioration at low current densities and plating film heat shock, areas often considered problems by competitors.

2. Film Properties



Competitor A (Rolled/Compressed)



Shedar 30 (Rolled/Compressed)

ZnNi plating film normally has a high degree of hardness, and the film is likely to peel off when compressed. Shedar 30 shows excellent ductility as film peeling is not so obvious as compared with the competitor's film.

3. Waste Water Treatment Test

Zn Ni plating presents another issue in addition to the deposition reduction and brightness deterioration due to the aged solution, that of metals not being able to precipitate in the waste water treatment. The following shows how metals in the Shedar 30 can precipitate in the waste water treatment.

Waste Water Treatment Test

- Make test solutions. Dilute solutions x 20 and x 100.
- ↓
- Add test metals. Add 100ppm each of Zn, Ni, Fe, Cr and Cu.
- ↓
- Adjust pH to 2. Adjust with H2SO4.
- ↓
- Adjust pH to 9. Adjust with NaOH.
- ↓
- Adjust solution level.
- ↓
- Add polymer coagulant. Add 5ppm of coagulant.
- ↓
- Filter solution.
- ↓
- Measure remaining metals. Measure with AA.

Plating Solution Diluted 20 times (ppm)

Metal	Competitor A	Shedar 30	Removal Rate (%)	
			Competitor A	Shedar 30
Zn	133.9	14.6	73%	97%
Ni	134.4	25.7	23%	85%
Fe	0.1	0	100%	100%
Cr	0.7	0.4	99%	99%
Cu	100.4	85.9	0%	15%

Plating Solution Diluted 100 times (ppm)

Metal	Competitor A	Shedar 30	Removal Rate (%)	
			Competitor A	Shedar 30
Zn	6.7	4.8	98%	99%
Ni	10.4	1.1	94%	99%
Fe	0.3	0.1	99%	99%
Cr	0.3	0.1	99%	99%
Cu	71.4	24.2	29%	76%

Shedar 30 shows good results for metal precipitation.