Rust Preventive Technology and Application

N.Arnon

ISO 9001:2008

www.98Oils.com

Content

1. Problems of Rust
2. Factors of Rust
3. Protection of Rust
4. Selection Rust Preventive Oils
5. Monitoring Rust Preventive Oils
6. Health and Safety
7. Rust Remover

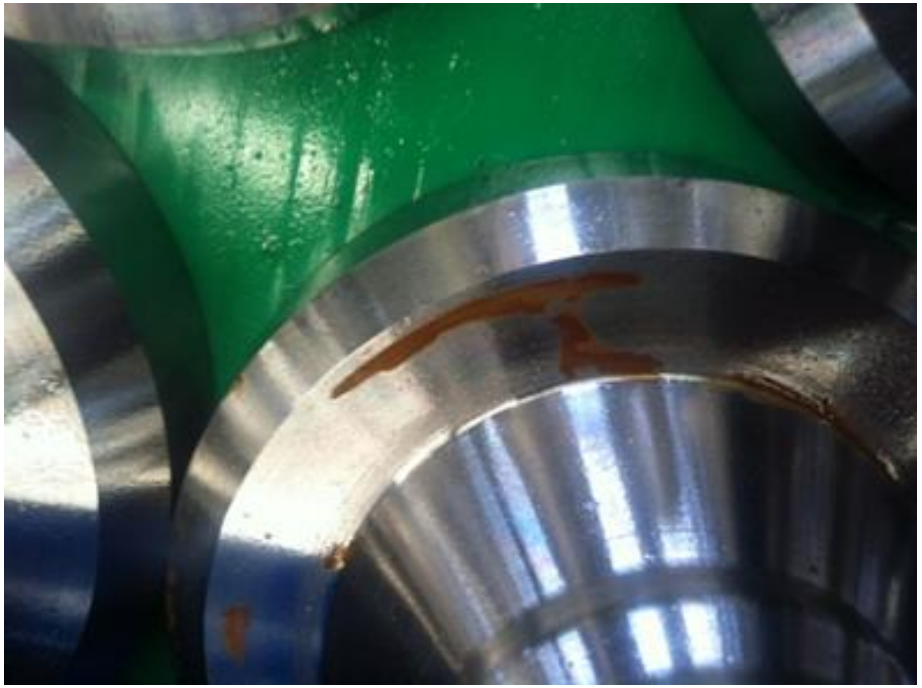
98Oils to AEC

1. Problems of Rust

- Return Transportation
- Re-Working the parts i.e. sandblast, acid wash
- Scrapping the parts
- Labor in sorting and cleaning parts
- More importantly, image of your company of your customers who receive your rusted parts.

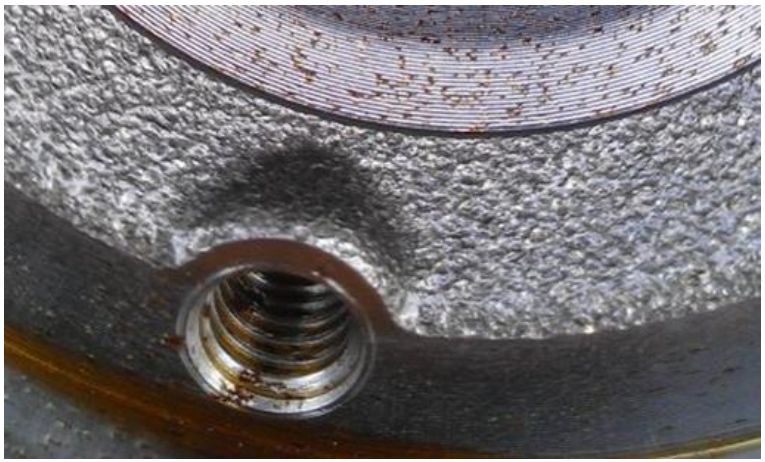
Rust from coolants after machining

Rust from coolants after machining

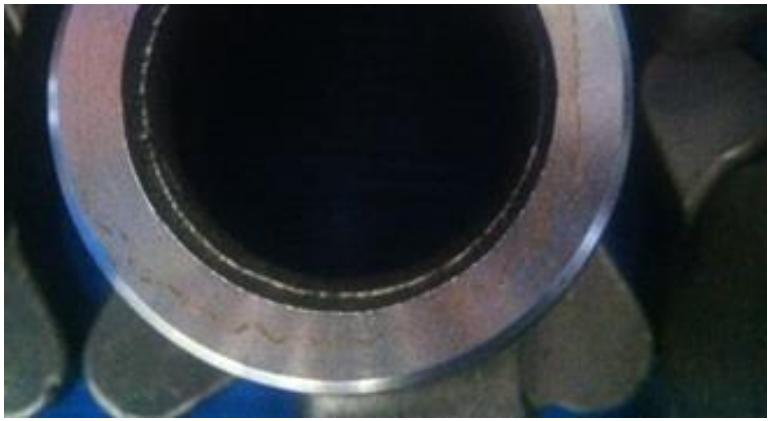


Rust, Red spot after dipping rust preventive oil

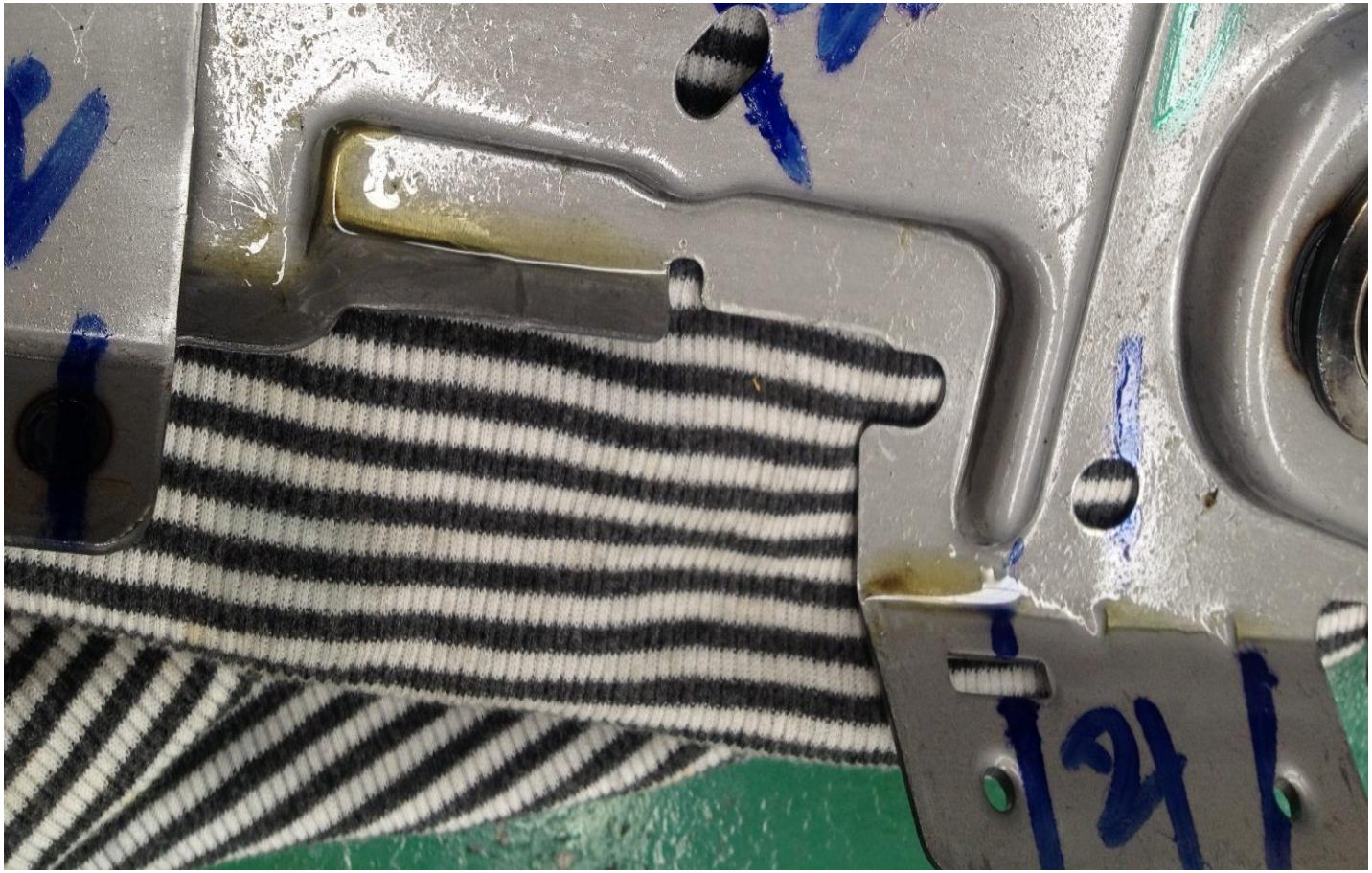
Rust and Red spot in strand



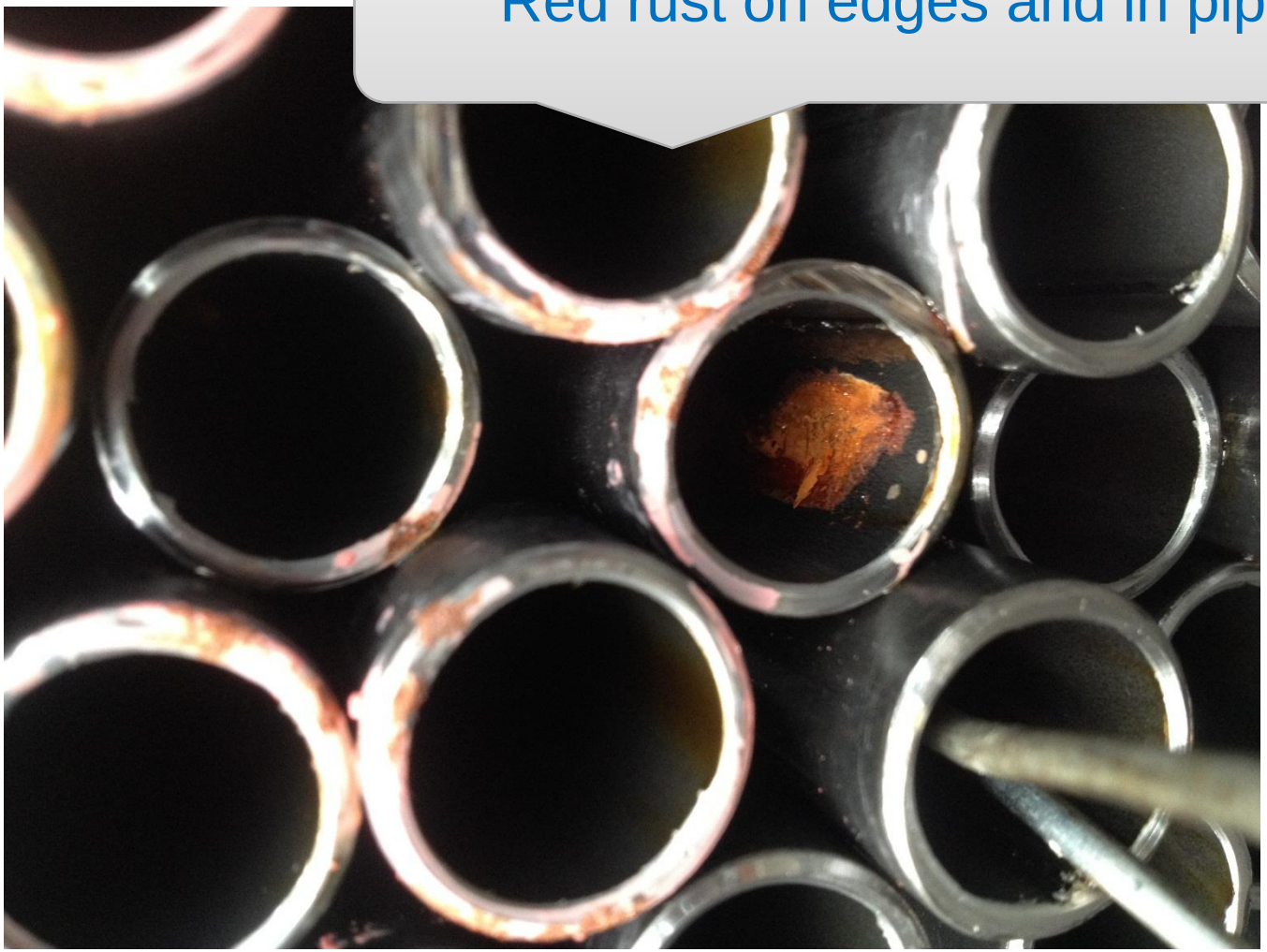
Red rust and stain after dipping rust preventive oil and invert parts



Brown rust, dust and oil on part

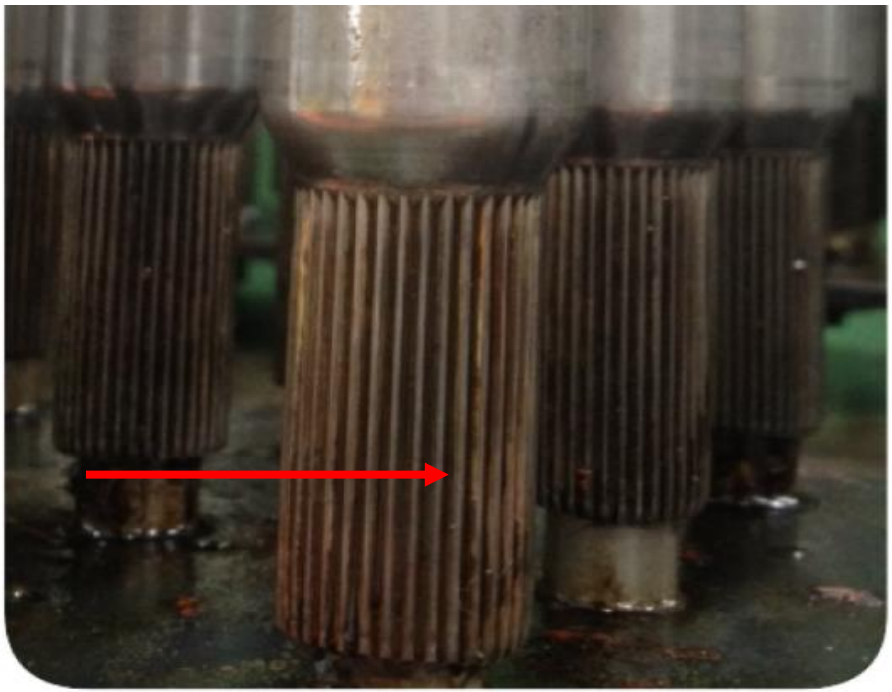


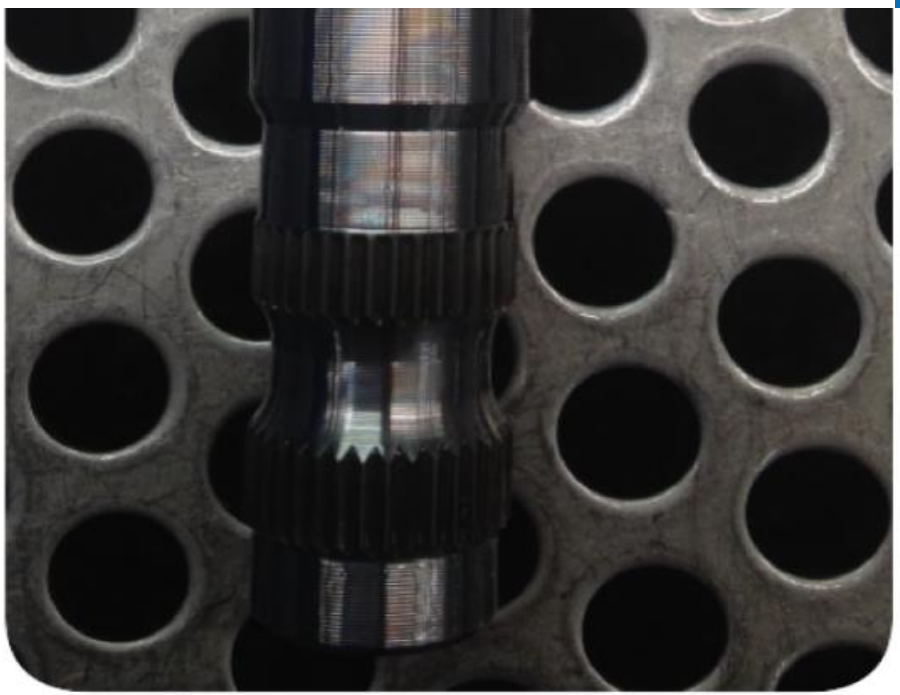
Red rust on edges and in pipe



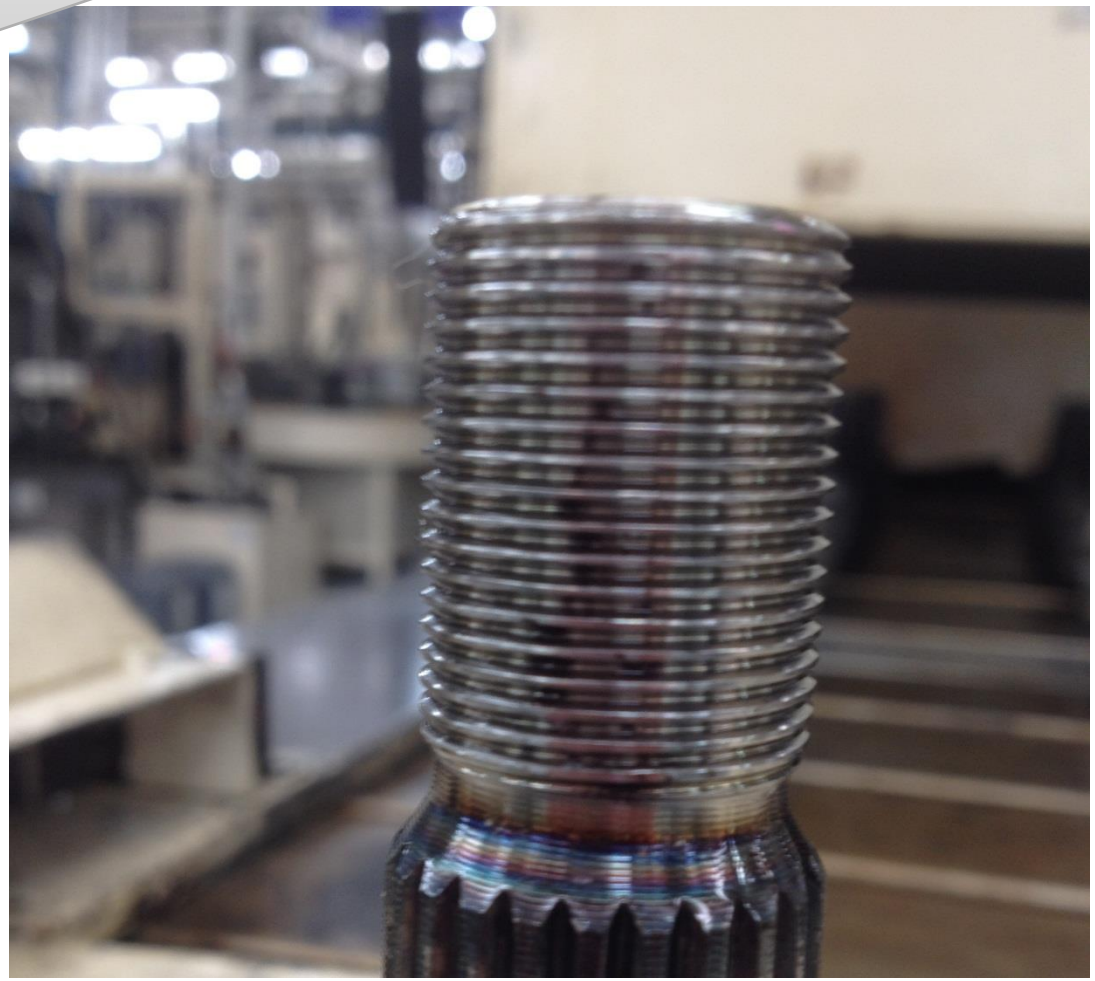
Black and red rust form used oil

Red rust after Cold Forging phosphate

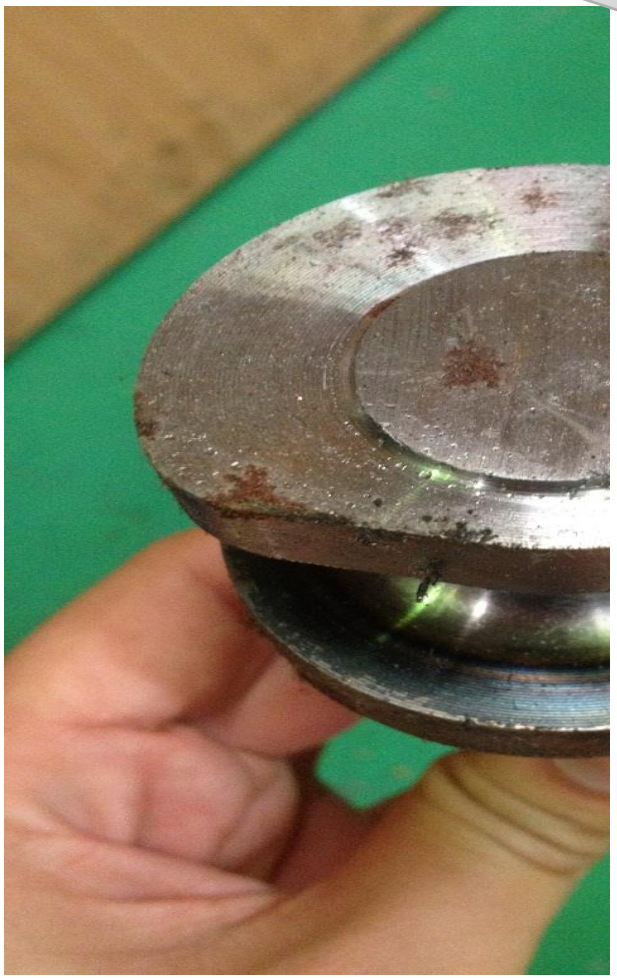




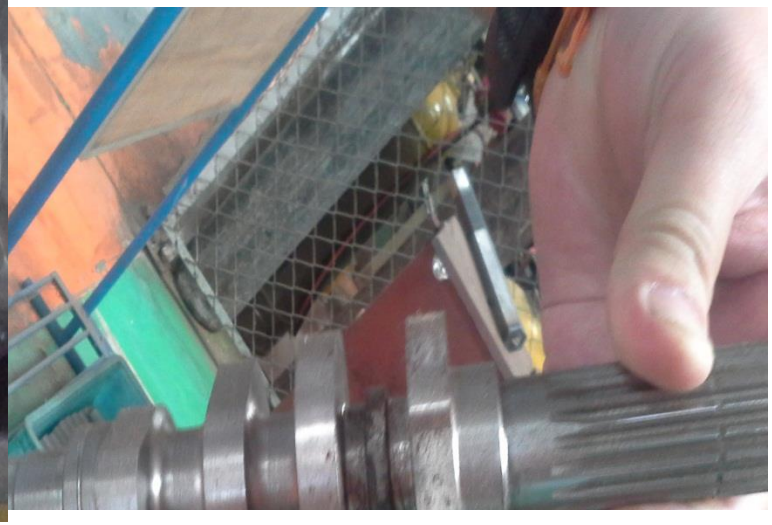
Black rust after quenching and screwing



Brown Rust on parts after Induction quenching



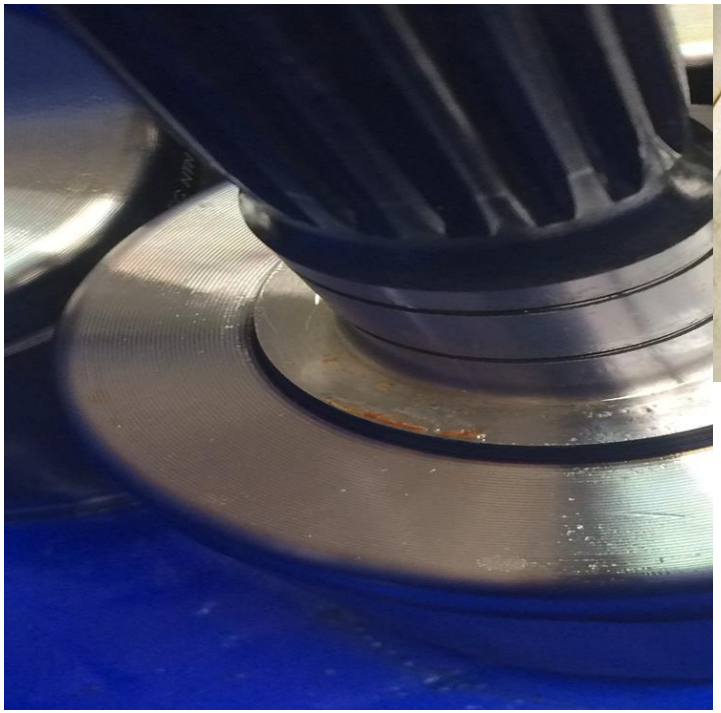
Red rust is packed in plastic bag



Brown rust on parts

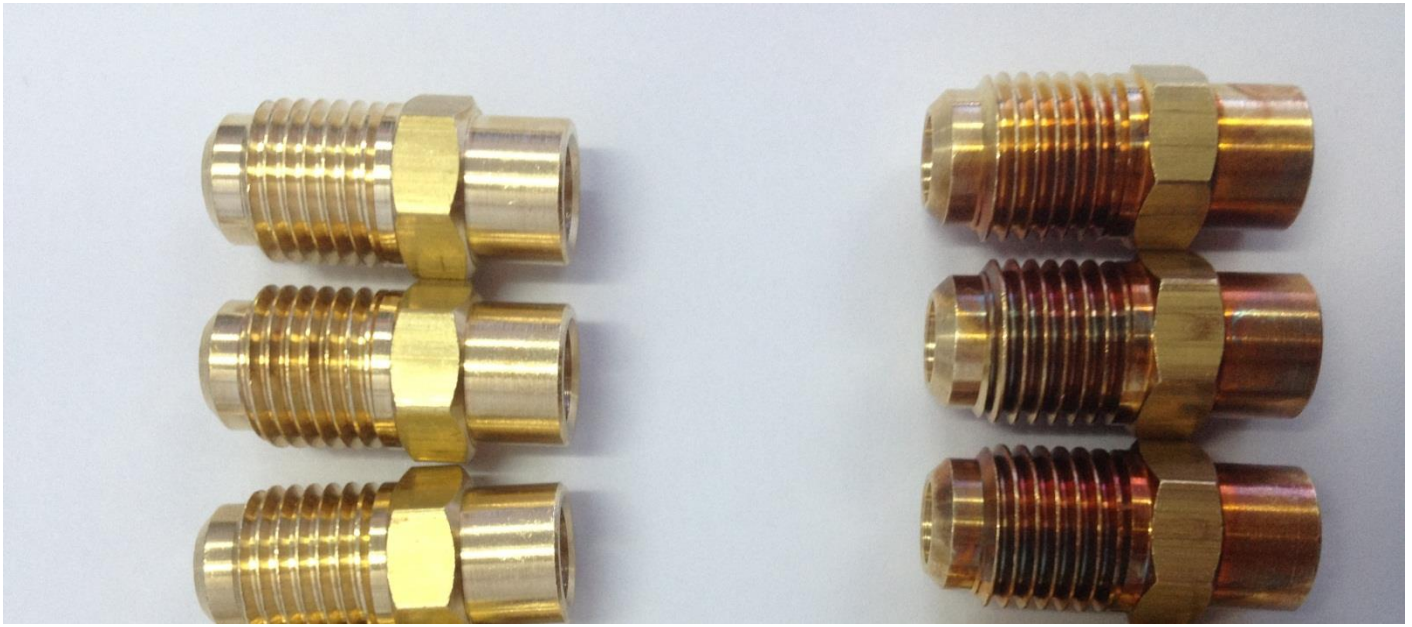
Red rust around welding area

Red spot after grinding



Red spot after grinding

Red stain on brass surface



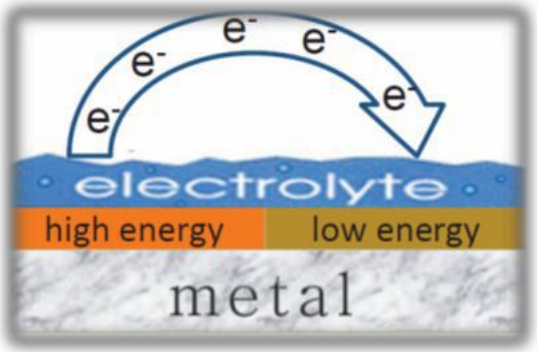
2. Factors of Rust

Corrosion is influenced by part & process factors;

- Electric Potential (high & Low energy area)
- Type and nature of the metal
- Metal and part processing

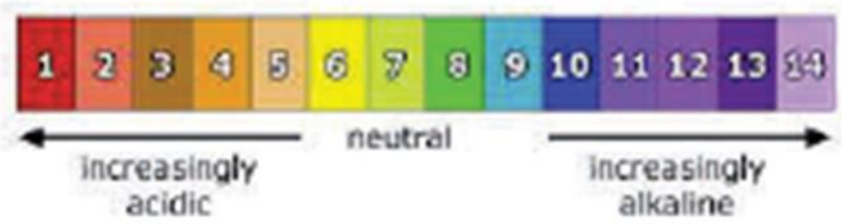
And many environmental factors;

- Relative humidity
- Contaminations
- Temperature



Process Corrosion Factors

- Cold Working
  - Creates electric potential differences
- Machining
  - Exposes grain boundaries and creates microscopic peaks and valleys
- Heat Treating
  - Creates potential differences and can be a source for contaminates

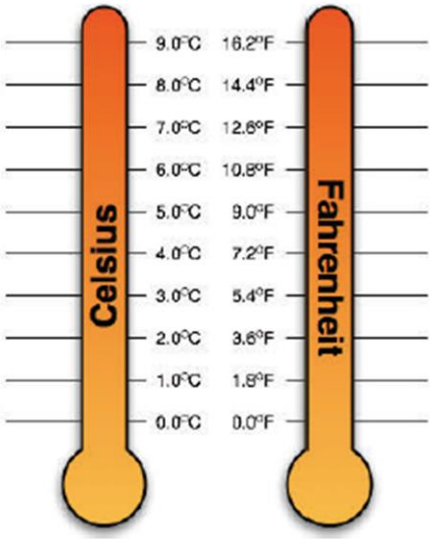


Process Corrosion Factors

- Cleaning
  - Poorly maintained cleaning solutions are a source of corrosion and may cause “Flash Rust”
- Handling & Packaging
  - Contamination from human handling or contact with untreated packing materials

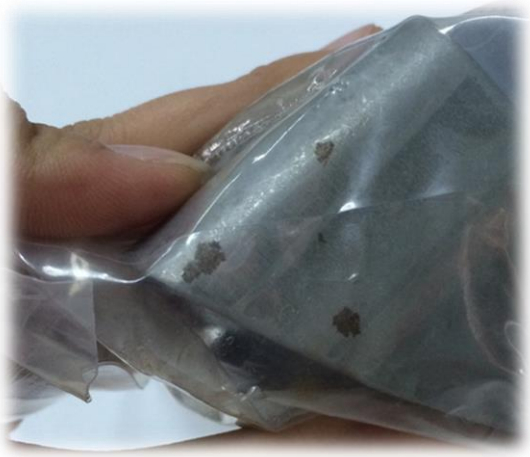
Environmental Corrosion Factors

- Temperature
  - A 10ºC rise double corrosion rate. Temperature variations also cause electrical potentials.
- Relatives Humidity
  - Provides the electrolyte

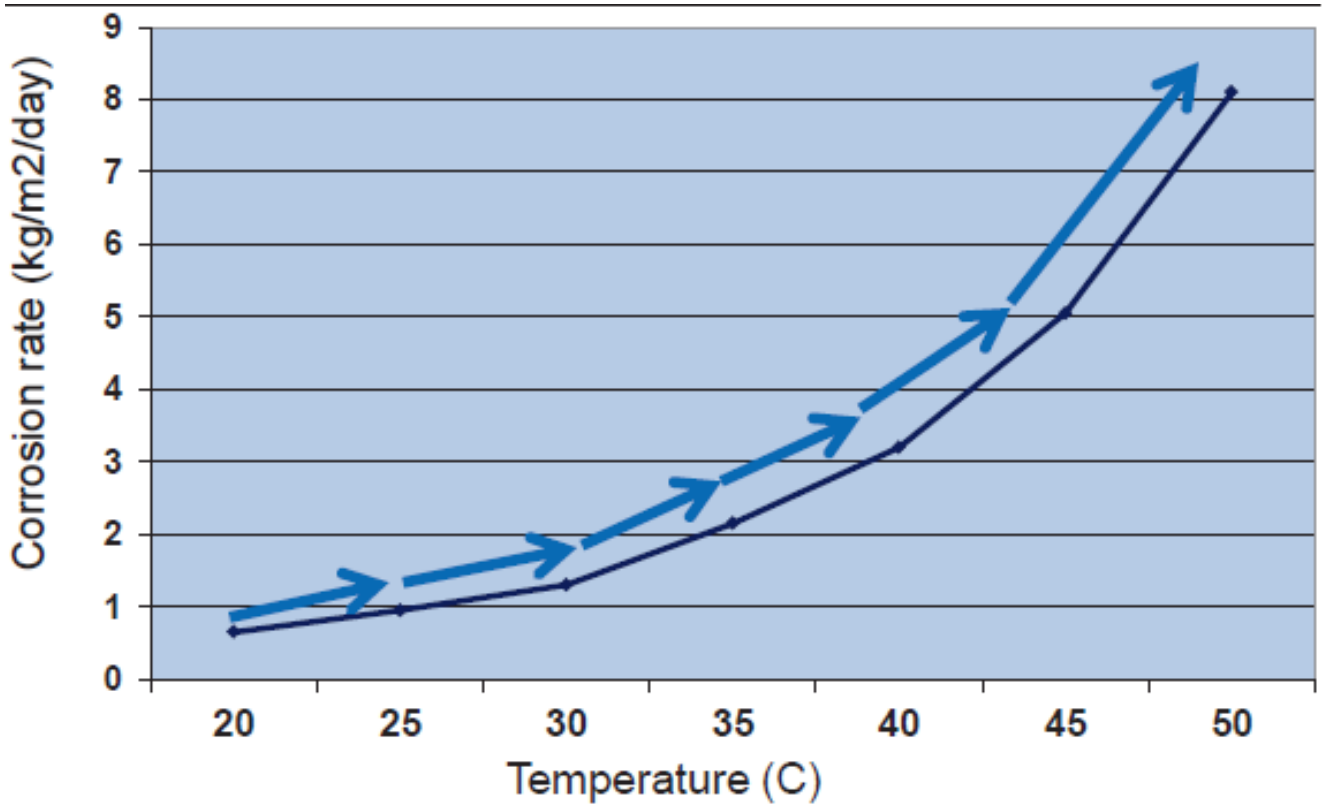


Environmental Corrosion Factors

- Combined Factors
  - Condensation and evaporation cause temperature gradients and bring contaminates in contact with the metal surface.



Temperature & Corrosion rate for low alloy steel

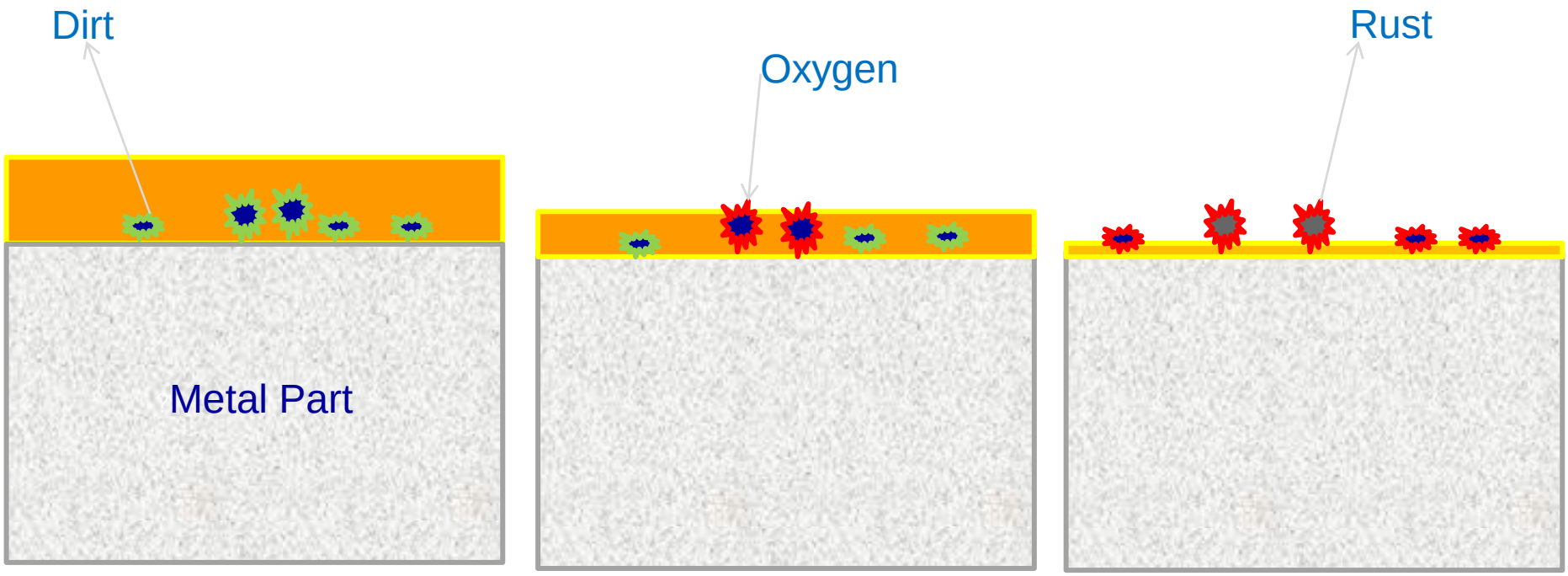


Corrosion rate up to temperature. If high temperature, corrosion rate will increase.

Factors of Corrosion

- Dirty Part
- Wet Part
- Existing Rust
- Packaging
- Application
- Miss Use Rust Preventive
- Incorrect Rust Preventive
- Dissimilar Metal

Why have rust when use Rust Preventive Solvent-Type and Oil-Type on dirt?



When solvent volatiled, dirt will receive oxygen. It causes rust. Dirt parts have rust occur.

Red Rust

Hydrated Oxides- High oxygen & water exposure

Heavy exposure to air and moisture, probably including a contaminate (salt)

Most likely atmospheric because no signs of rust runs on equipment.

Uniform corrosion, probably from very corrosive environment.

Yellow Rust

Very soluble iron oxide

Rust in recessed areas with rust “runs and drips” (solvated rust)

Very high moisture content, puddled/ standing water most likely present.

Brown Rust

Ferric Oxide – High oxygen lower moisture

Drier Rust

Most likely atmospheric.

Localized rust, possible contaminate on surface from process.

Black Rust

Iron (II) Oxide – Limit Oxygen

Black thin film rust.

Appears as black staining. Most likely had something covering black rust areas preventing oxygen from reaching the surface.

More stable rust layer that does not propagate as rapidly as other rust forms.

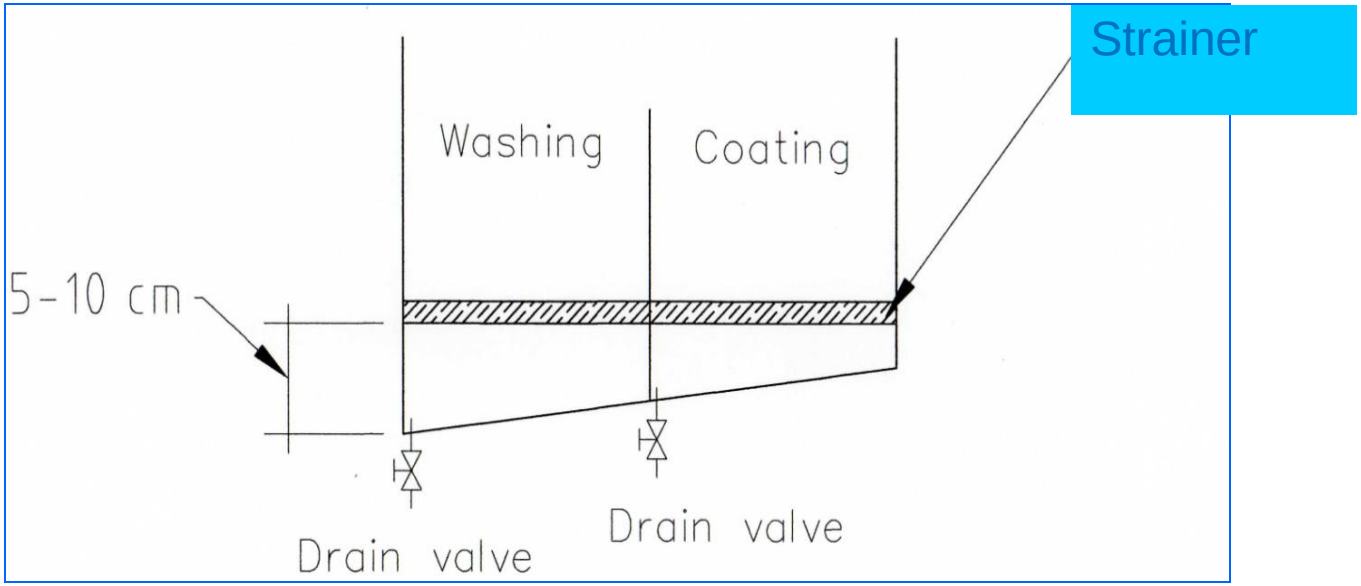
3. Protection of Rust

- Tank design
- Process Control
- Rust Preventive oils

Tank design

For parts after forging or machining

- Material is made from stainless or fiber for non-accumulated rust
- Devided 2 tanks
- Have drain systems
- Have strainer for prevent water and particle fine from bottom



Dipping parts

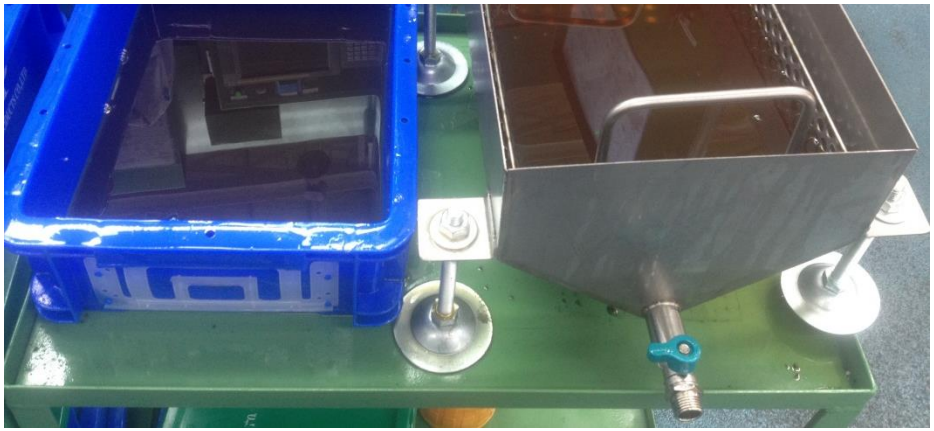
Recommended 2 times

1. Washing or Cleaning
   - For clean dust, iron ship and others.
2. Coating
   - For coating surface, should soak in RP oil for 5-30 minutes and dry before packaging

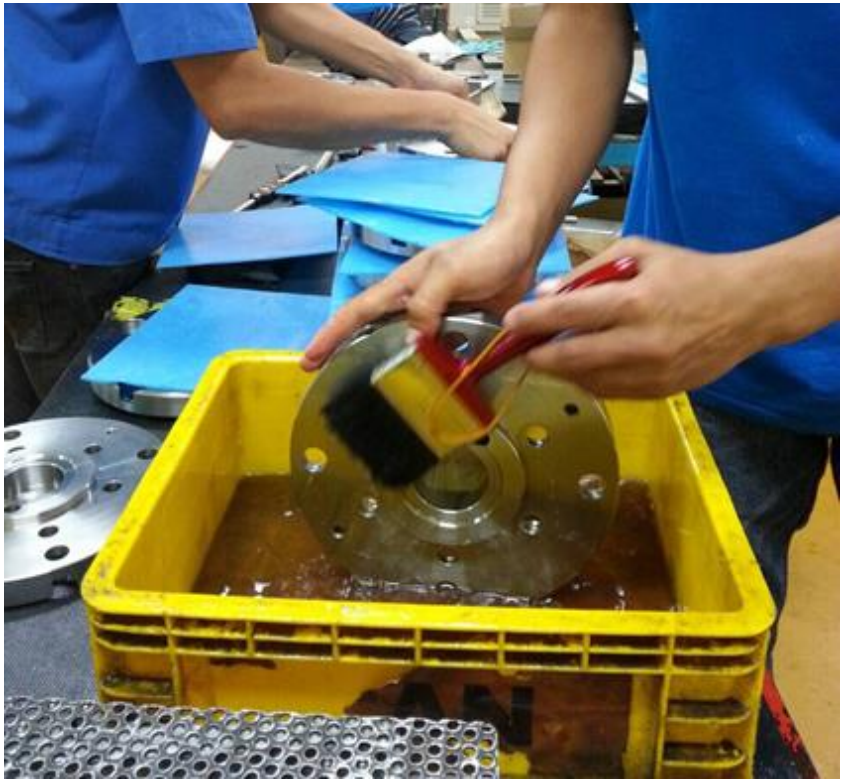
Remark**

Clean parts before brushing or spraying

Many Type of Tanks



Wrong Design



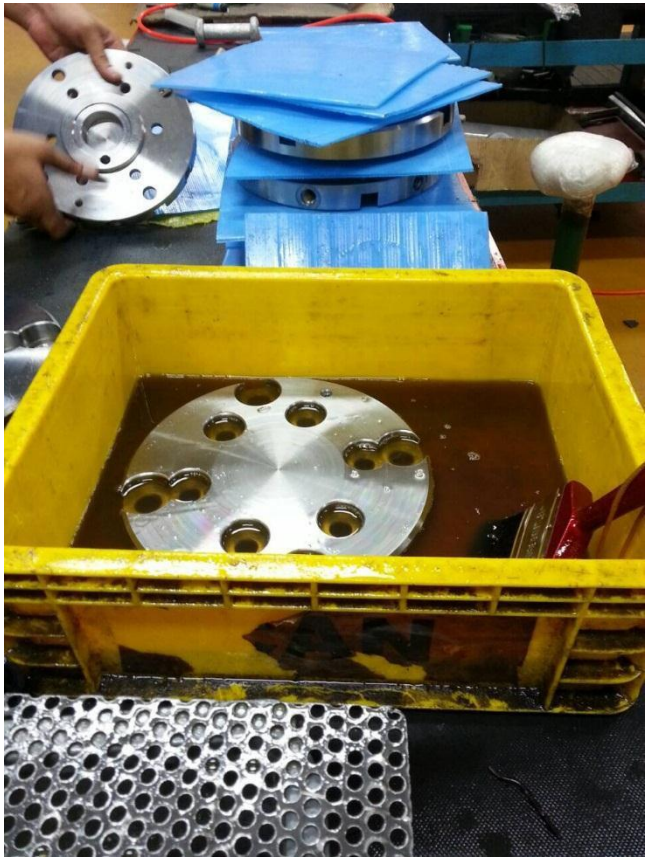
Process Control

- Check part in process before rust protection
- Check rust preventive oil
- Regular drain water and dirt from Tank
- Top up Rust Preventive oil
- Check cleanliness of part at tank 1 before dip in tank 2.
- Wear glove (plastic)

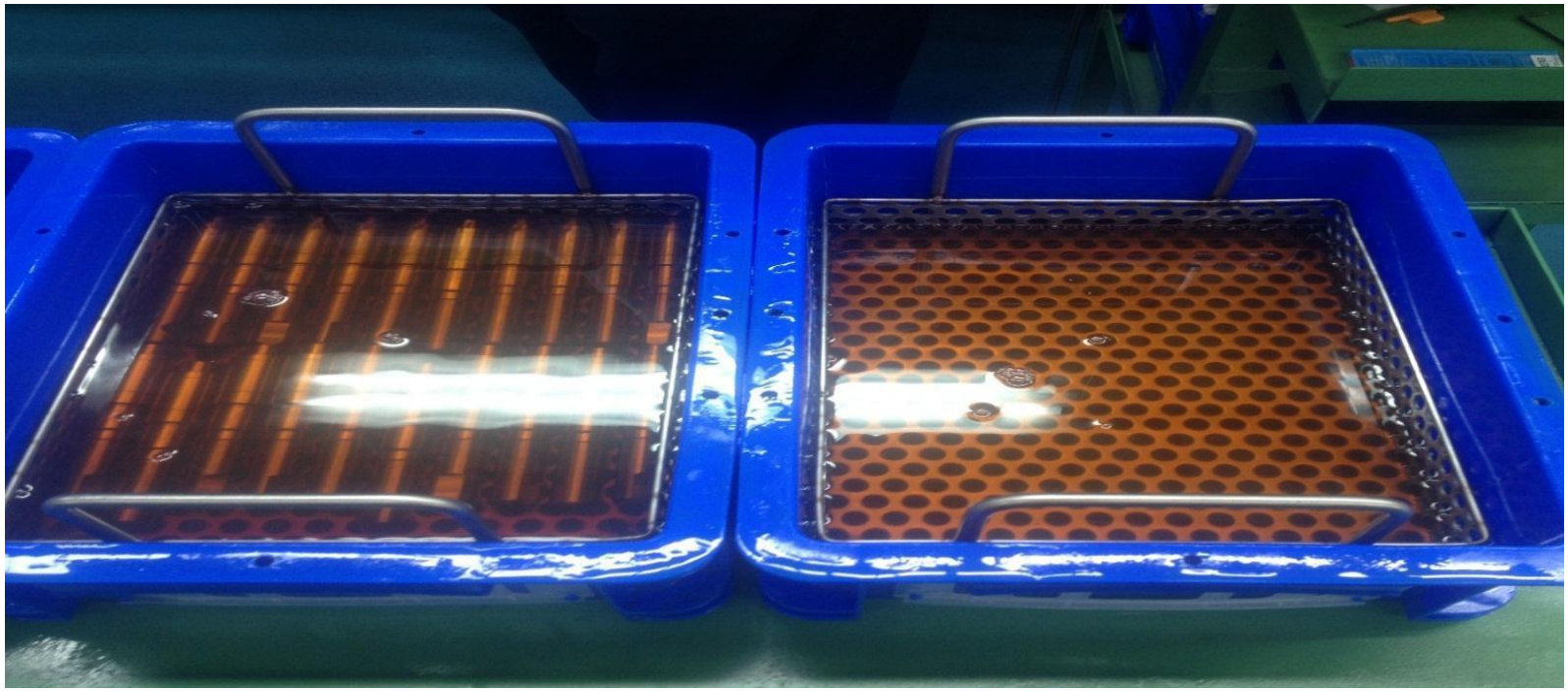
Case Study 1

Procedure to use RP

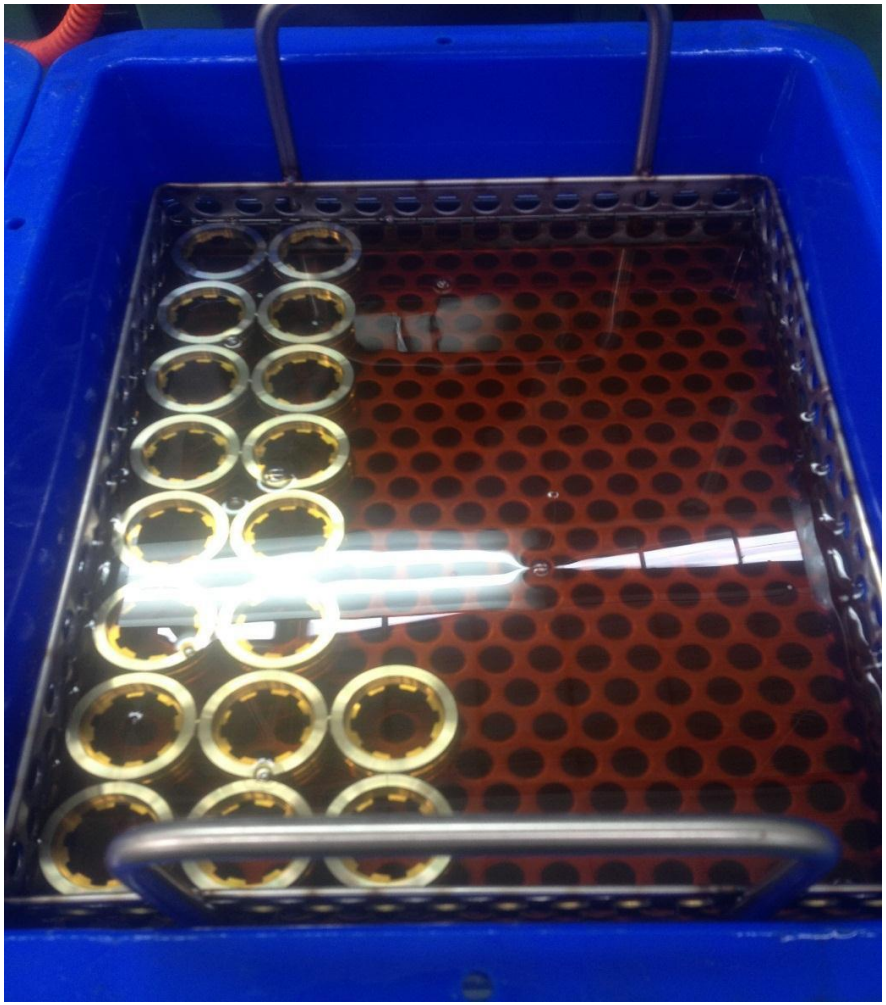
- Not direct contact with parts



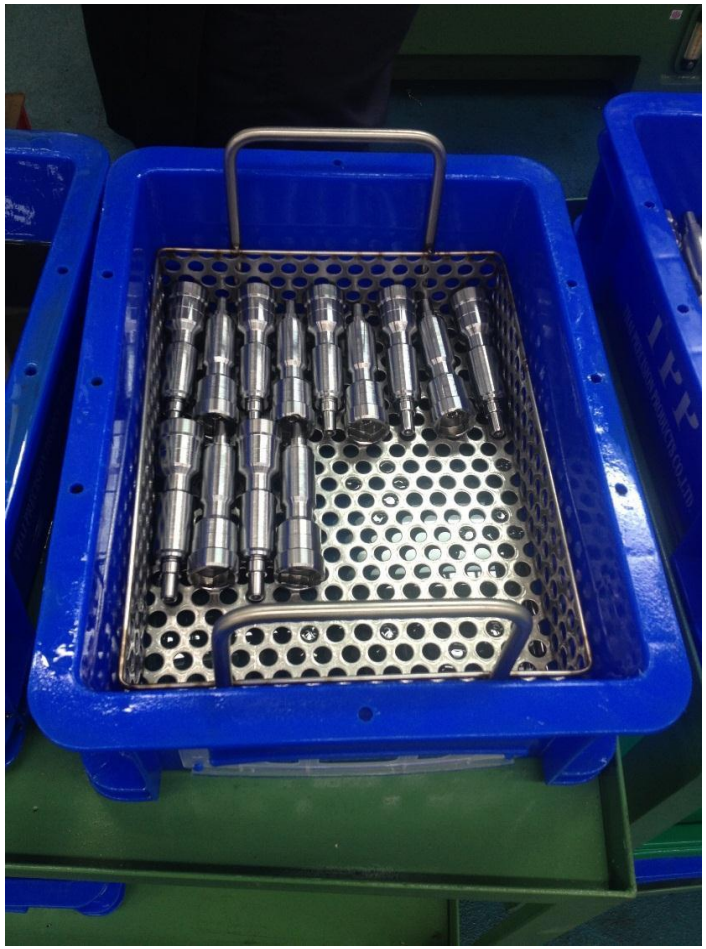
- The part into a process which have water component such as coolant should have 2 tanks
    - Tank 1 For clean dust, iron ship and others. And dewatering form coolant
    - Tank 2 For rust protection (coating)



- Use the grate to support part for prevent dirt spreading

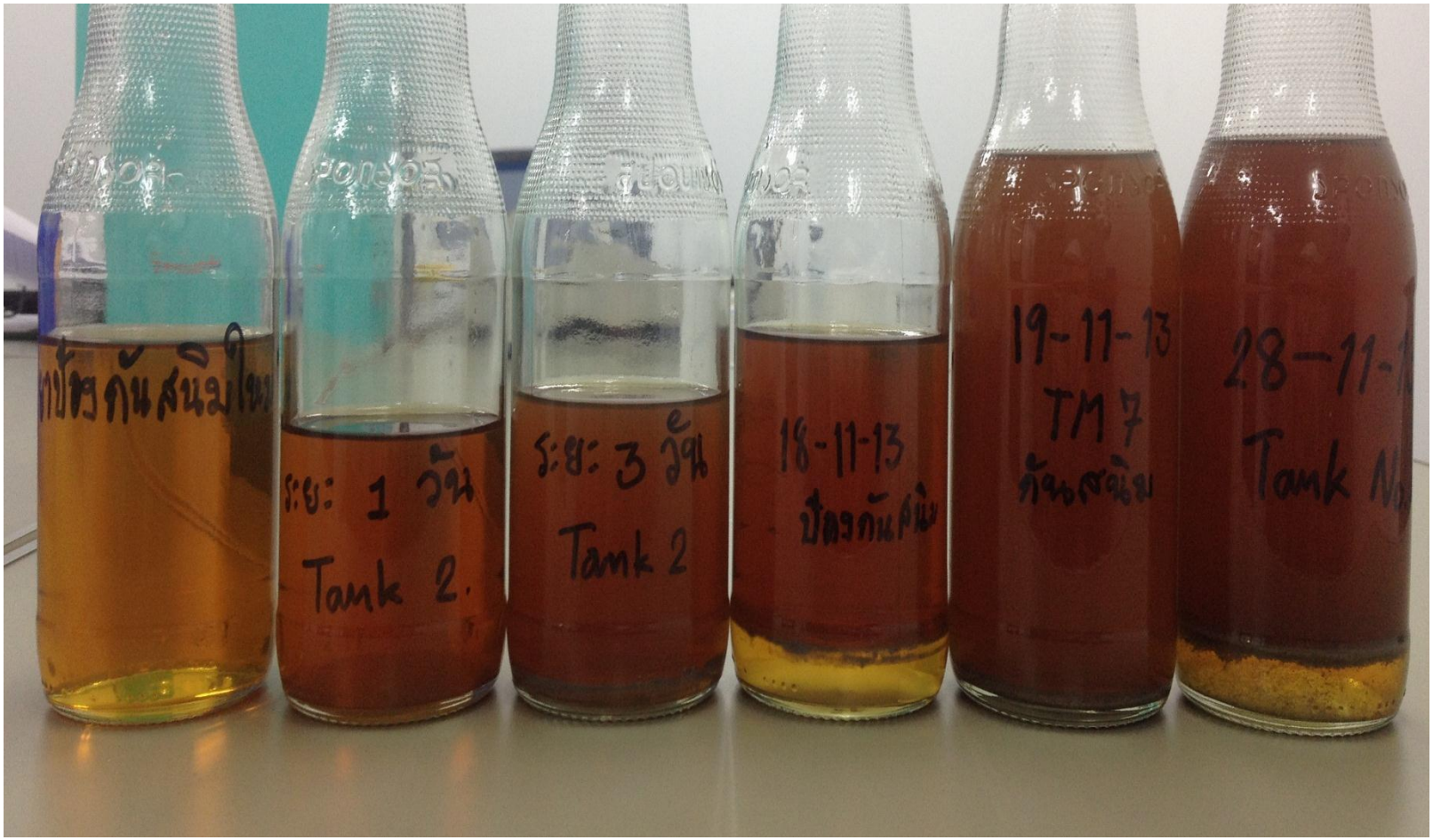


- After dipping into RP, leave it and stand allowed before packaging

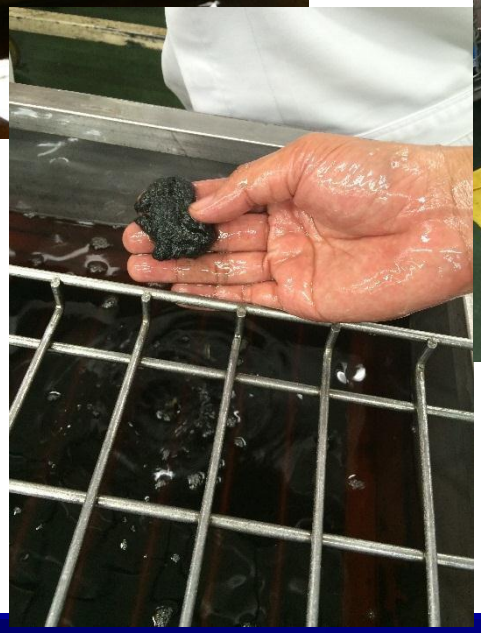


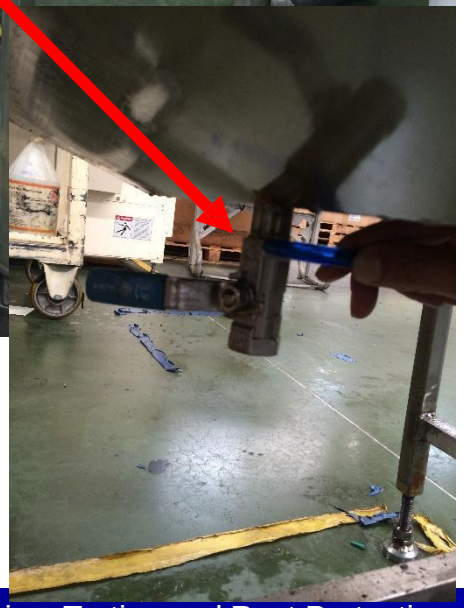
- Put magnetic bar into the bottom of tank for remove impurities, steel particle fine

- Regulary QC check



- Cleaning tank, drain water and waste





9 Commandments

1. Part should be clean, dry, without oil strain or dust from shot blasting (In the case of part is dirty, devided 2 tanks of RP)
2. Avoid direct contact RP, should be wear plastic glove while working
3. Part don’t have heat accumulate
4. While dipping into RP oils, make sure that RP oil coat cover surface
5. After dipping into RP, leave it and stand allowed for 30 minutes before packaging

6. The part storage for long time, must have plastic sheet cover surface
7. Store should be without dust and moisture
8. RP tank should be drain out of water every day or before use.
9. RP oil must be changed every 1-2 months. After taking out RP oil, should be clean and allow to dry before fill RP oil.

4. Selection of RP oils

RP Markets

Steel Tube & Pipe

Steel Wire

Second Tier Automotive

Forged component

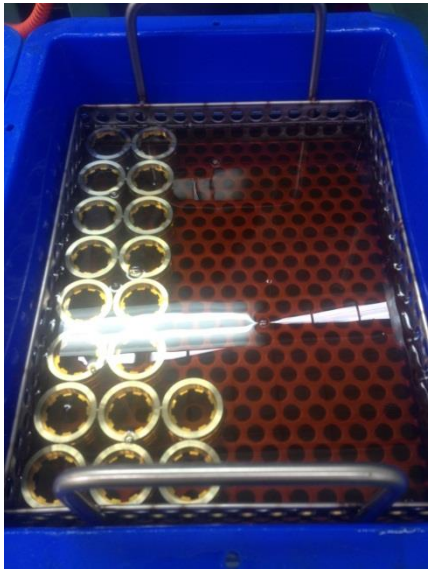
Fasteners

Bearings

Etc….

Type of Rust Preventives

1. Solvent based – Dewatering
2. Solvent based - Protective film
3. Water Based – Emulsions
4. Water Based - Corrosion Inhibitor
5. Oil based
6. Hot melt waxes



Type of Rust Preventive & Comparison

Type	Compositions	Advantages	Disadvantages
1.Oil Base	Oil + Additives	-Thick film, long term protection - Excellent lubricity	-Dirty -Strong odor
2. Solvent Base	Solvent + Water Displacing + Additives	-Thin film, medium term protection - Good lubricity	- Mild/Moderate odor - Not dirty
3. Water Base	Water + Emulsifiers + Additives	-Thin film, short term protection - Not good lubricity	-Less dirty but easy to clean -Chemical odor -Difficult maintanence

Performance Requirement

CORROSION PROTECTION

- STORAGE CONDITIONS
  - Indoor, Outdoor Covered, Outdoor, Uncovered, etc.
- PROTECTION DURATION
  - Days, Weeks, Months, Years
- ENVIRONMENTAL FACTORS
  - Humidity, Salt or Acid, Atmosphere, Solar Radiation, Chemical, Biological Factors, etc.

Performance Properties

- Water Displacement or Water Separation
- Non-staining
- Lubricity – Anti-wear or Extreme Pressure
- Low Temperature Solubility

Additional Requirement

- RESTRICTED COMPONENTS
  - Barium, DEA, Boron, Aromatic Solvent, etc.
- FLASH POINT LIMITATION
  - >40°C, >60°C, >150°C, etc.
- PHYSICAL PROPERTIES
  - Color, Odor, Viscosity, VOC, etc.
- Cost Restrictions

Desire Protection Film

- Oily or waxy
- Soft, Tacky or Dry
- Visible or invisible
- Removable (by solvent wash, alkaline cleaner, steam, etc.), Semi-permanent or Permanent

Application Method

- Spray
- Dip tank
- Brushing
- Aerosol
- Other

Type of Metal Substrate

- FERROUS
  - Cast iron, Cold-rolled steel, etc.
- NON FERROUS
  - Aluminum, Copper, Brass, Bronze
- COATED
  - Galvanized, Phosphated, etc.

Metal Finish Type

- Polished
- Ground
- Smooth
- Rough
- Other

Lube-Kote Range

The Lube-Kote Range of products were developed since Year 2006 with specialist from Europe and American.

The range is based on the latest raw materials available, in many cases CHSAC are the only lubricant manufacturer using these grades from Europe and USA.

The range has been developed as a dedicated rust preventative range and has not used technology from other product sectors

Performance Additives

Form 2 biggest Main Additives from Leader of rust preventive material world wide company.

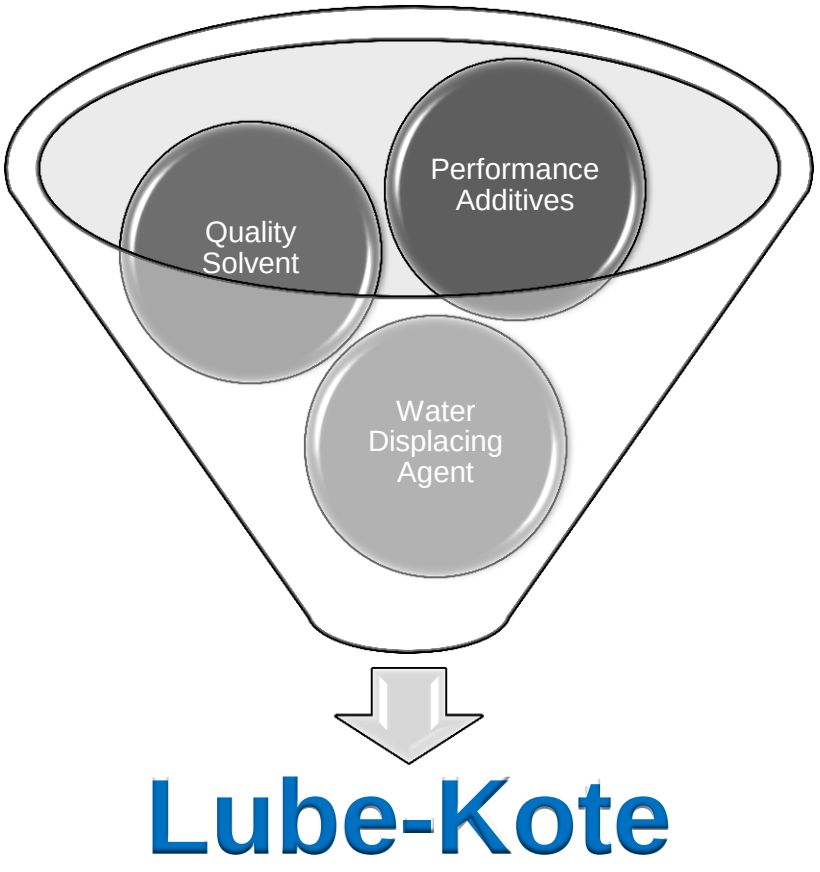
Main Additive from

- Europe
- USA

Compositions

Main Compositions

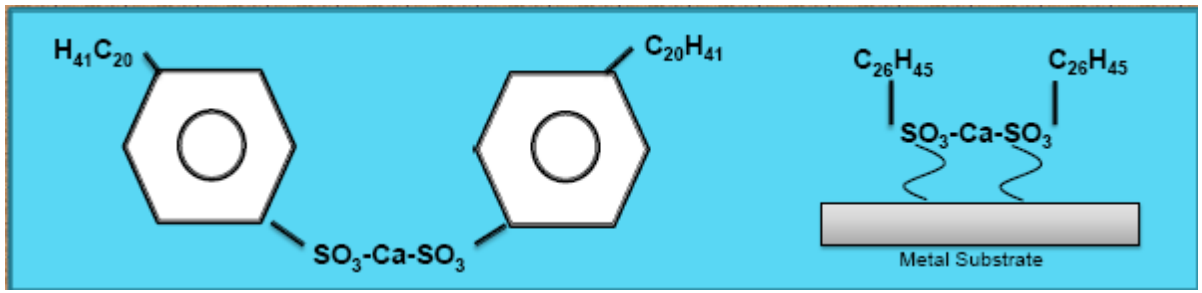
1. Solvent
2. Performance Additives
3. Water Displacing Agents



Structure and How they work?

Corrosion Inhibition:

- Sulfonate products work as corrosion inhibitors by the $-SO_3X$ Structure attaching to the metal substrate. The organic tail angles away from the surface and inhibits water and dirt from approaching the surface.



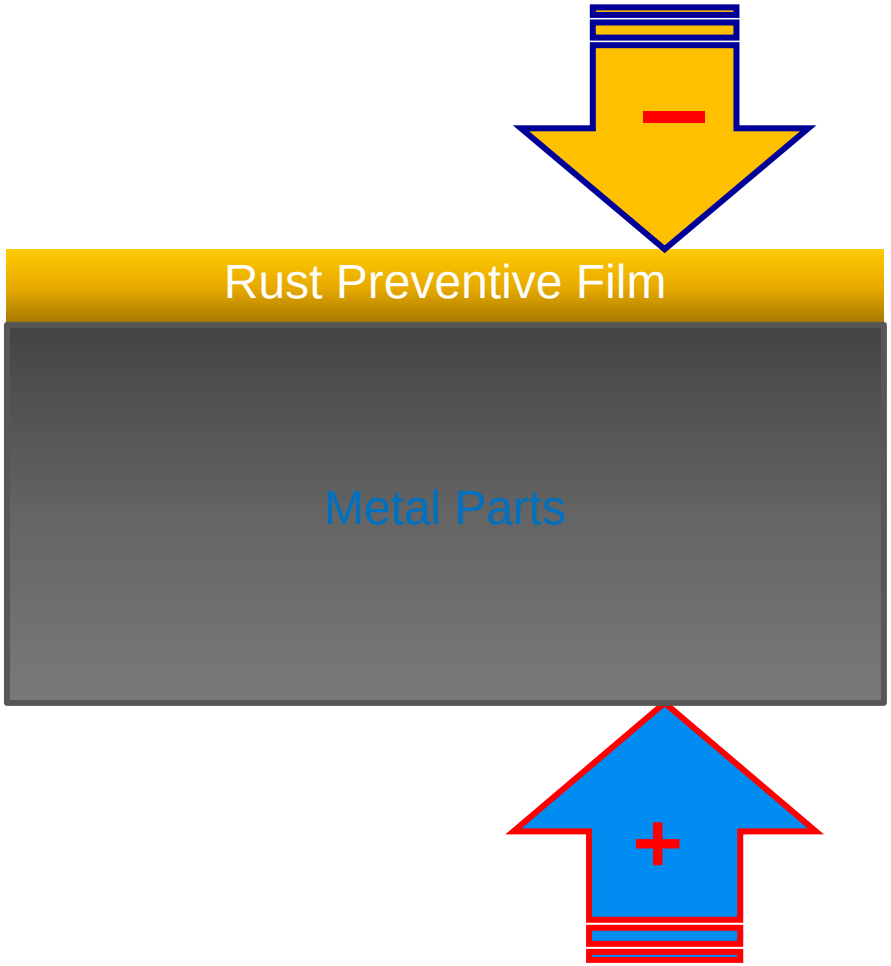
The Mechanism of Rust Preventives

a. Polar Attraction – Sulfonate molecules are highly polar and attach to the metal surface like little magnets to yield excellent surface wetting. The hydrocarbon tails of the sulfonates project out wards to repel moisture.

b. Barrier Film – The sulfonate's hydrocarbon tails attract additional hydrocarbon components found in the rust preventative which help form the hydrophobic (water repelling) barrier film.

c. Passivated Environment – if overbasing is present, then calcium carbonate or calcium hydroxide can slightly dissolve with moisture creating a high pH environment. Iron does not corrode under these conditions.

Rust Preventive Film

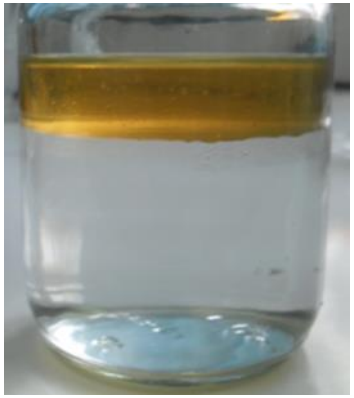


Polar Magnetic Adhesion Technology

Sulfonate molecules are highly polar and attach to the metal surface like little magnets to yield excellent surface wetting

Water Displacing Agent

Water displacing Agent and the sulfonate's hydrocarbon tails attract additional hydrocarbon components found in the rust preventative which help form the hydrophobic (water repelling) barrier film.



Anti-Finger Print Additive

For finger print suppressant

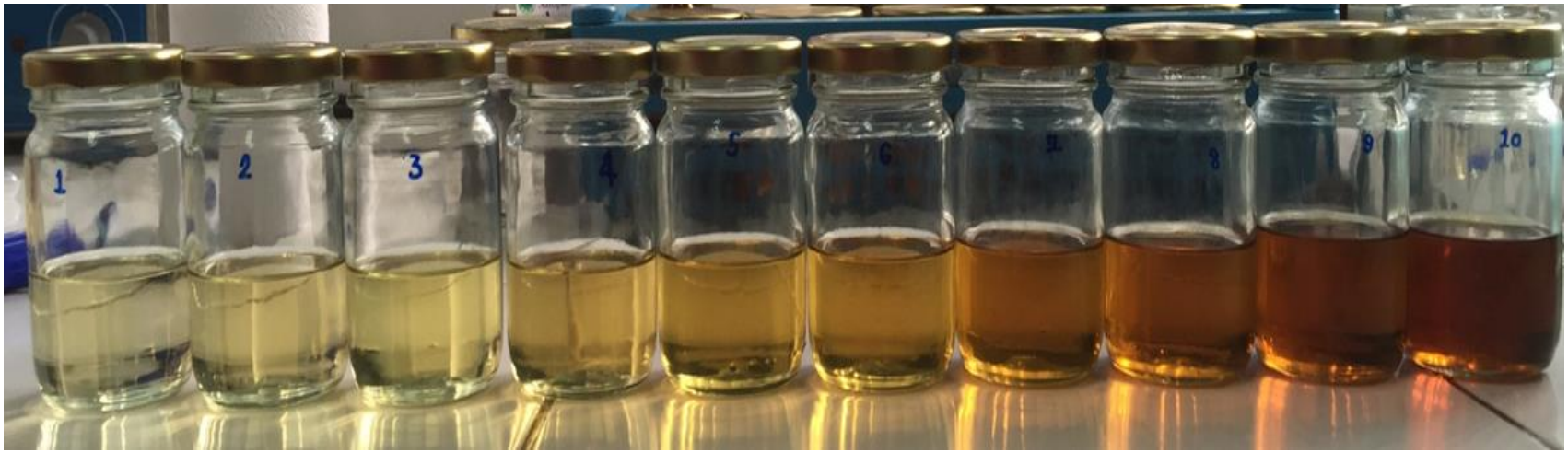
Test by Salt Spray Test

Lube-Kote 19

Lube-Kote 15

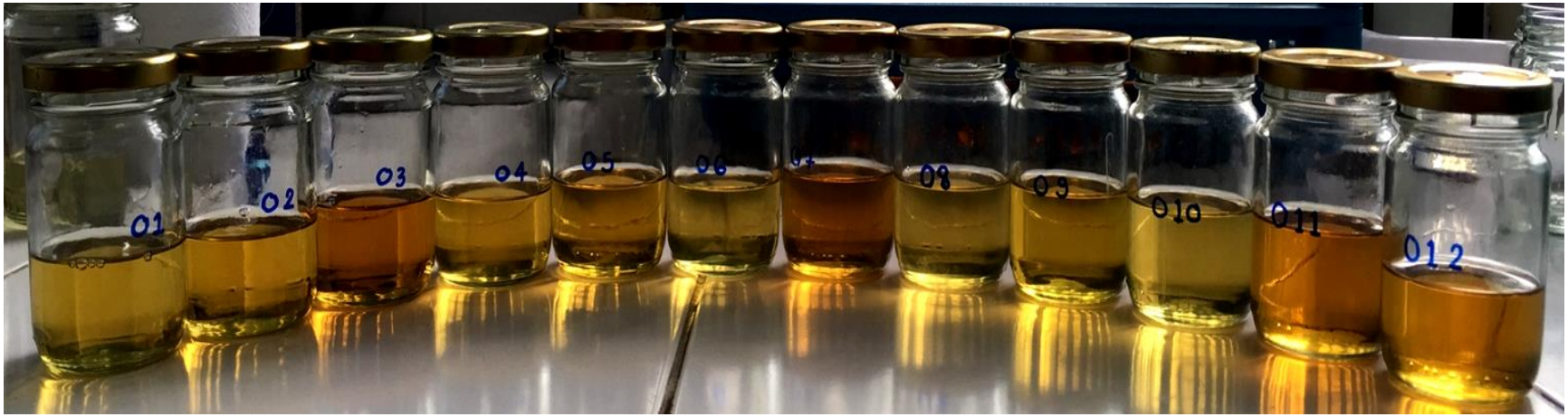
Color Shade

Level 1-10



Level of Odor

Level 1-12



Level	Odor	Level	Odor
1	Very Slight	7	Moderate
2	Slight	8	Moderate
3	Mild	9	Strong
4	Mild	10	Strong
5	Moderate	11	Very Strong
6	Moderate	12	Very Strong

Performance testing

Solubility	
Exxsol D-40 / 60 / 80 / 95	Clear
Isopar M	Clear
SUAF (Naphthenic Oil)	Clear
Motiva Star 4 (Shell GP II)	Clear
ESSO 150N	Clear
ESSO Jurong (GP II)	Clear
Ultra S-4 (S-Oil GP III)	S. Hazy
Water Separation (15% in 140 Solvent, 60C)	
Time to Separate	2:22
Water Layer	Clear
Organic Layer	20C/55H
Humidity Cabinet (5% in 140 Solvent, 60C)	
Days/Failure	60+
Salt Spray Cabinet (15% in 140 Solvent, 60C)	
Hours/Fail(SB)	>24<40 (25%)
Water Displacement (5% in 140 Solvent, 60C)	
1:1 Dilution	Pass
Emulsion	Pass
Stack Stain Test	
15% in 140 Solvent, 60C	Pass
Water Contamination	Pass
Cold Temp Solubility (15% in 140 Solvent, 60C)	
At 5C	Hazy Liq
At -20C	Hazy Liq
Return to RT	Clear
Physical Properties	
Acid #	4
Specific Gravity	0.94
Colour	2.5
Colour (15% in D80 Solvent)	2.5
% Barium	4.8
Viscosity, cSt at 100C	14
SAP #	40

Color Shade Selection

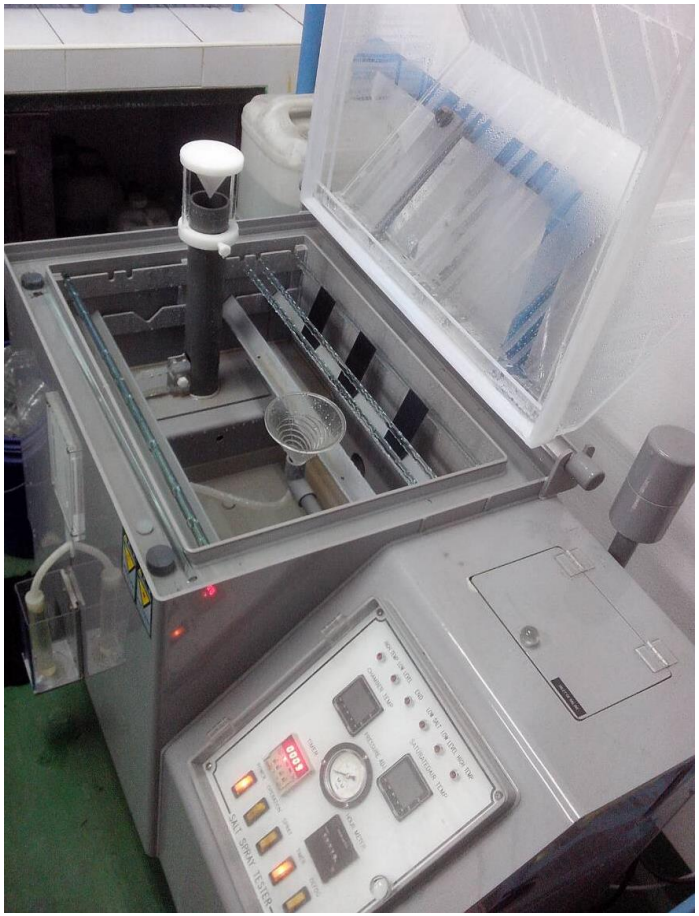
Salt Spray Test

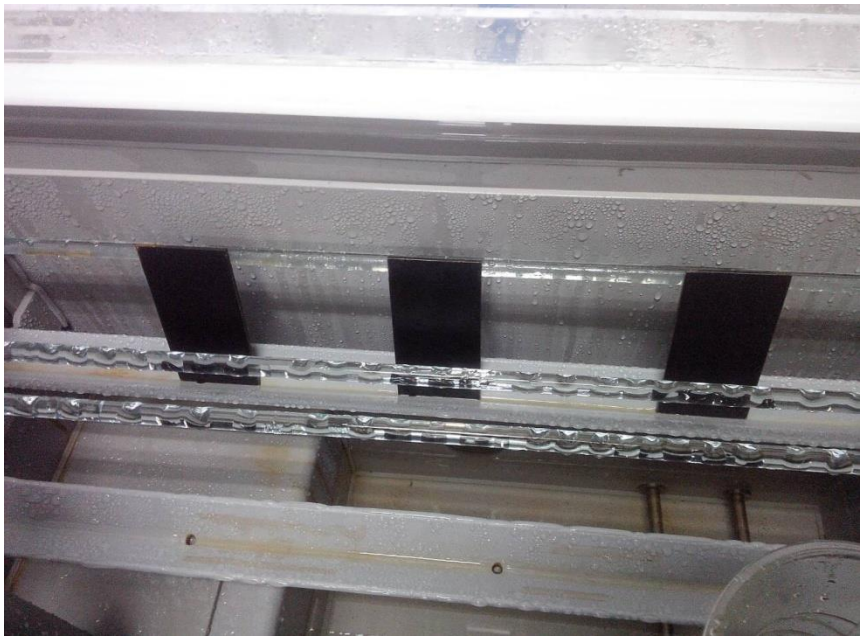
To confirm performance of product

Follow ASTM B117

Salt Spray Test Machine

Salt Spray Test Machine





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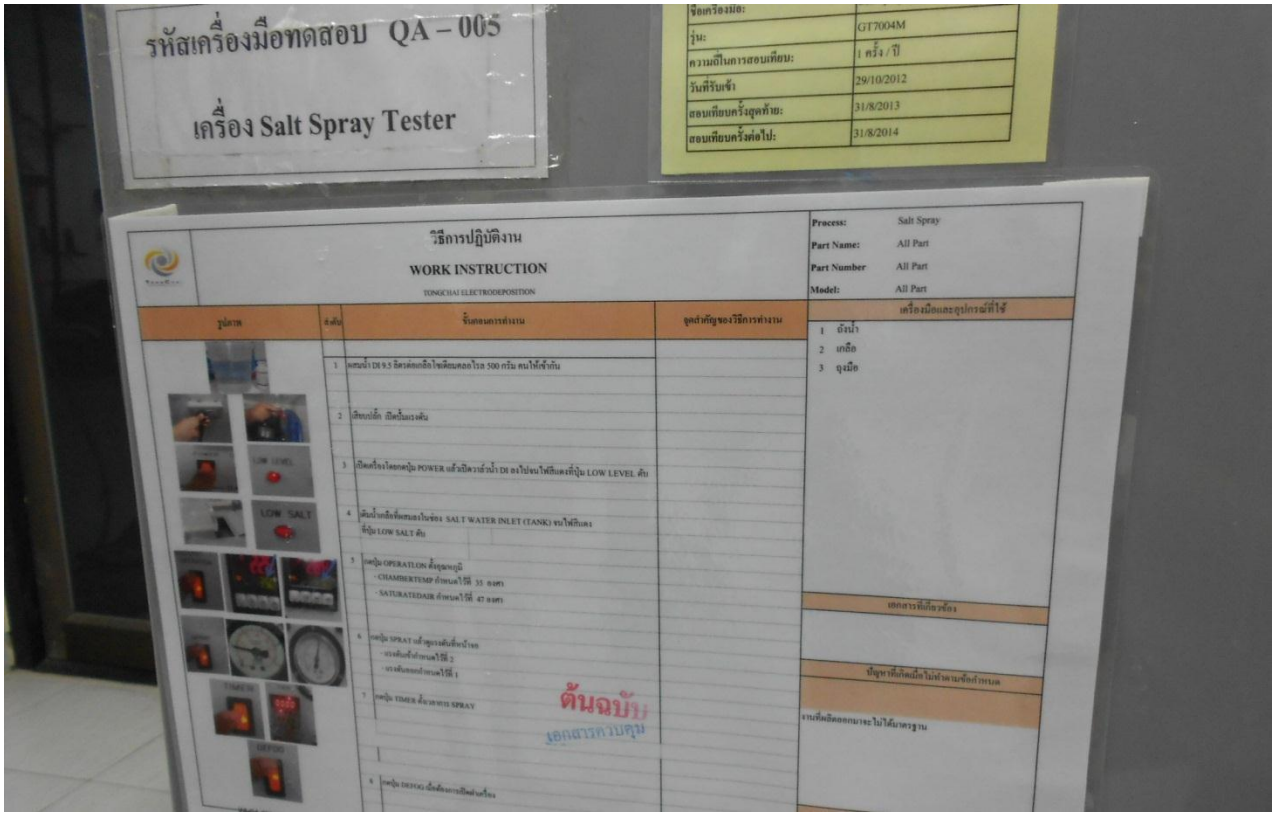
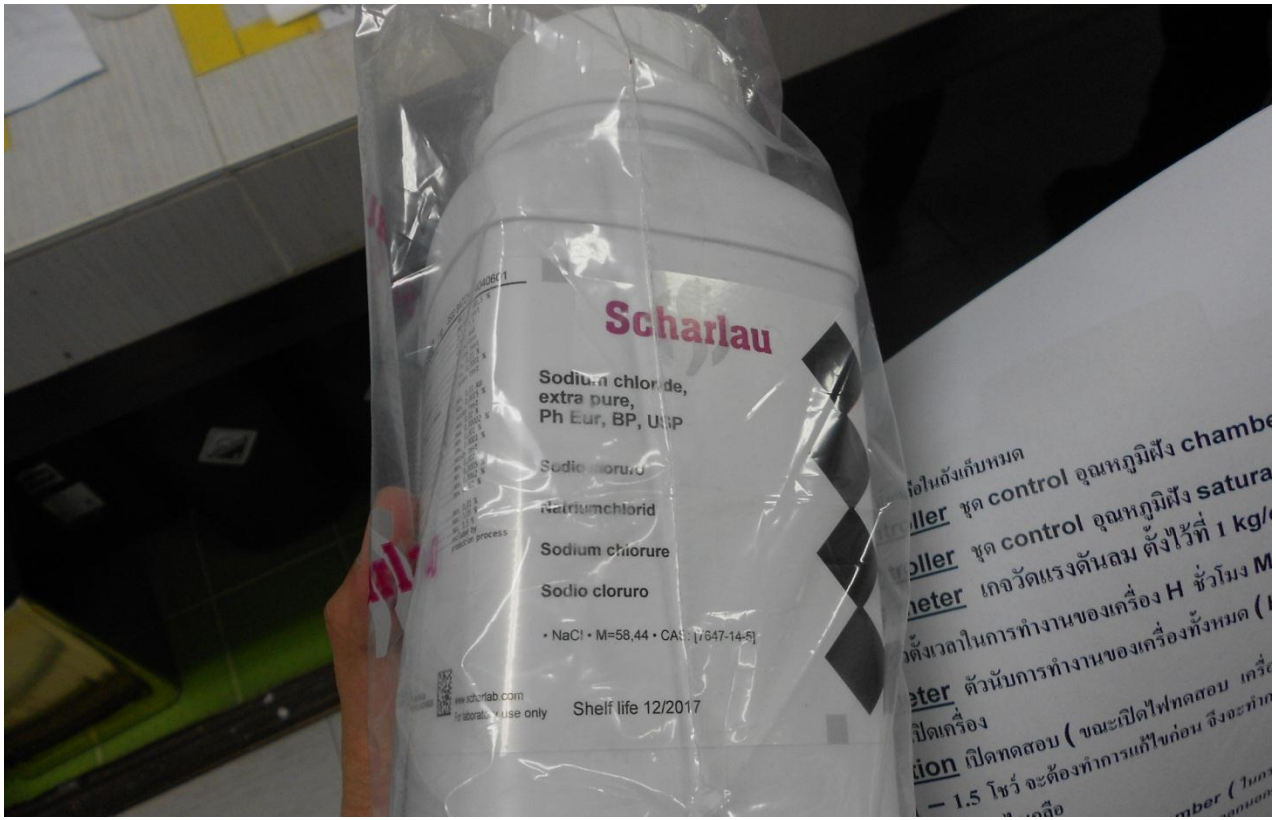
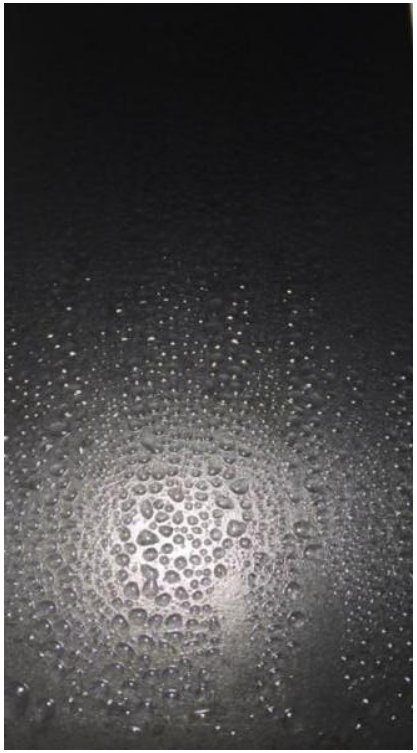

รหัสเครื่องมือทดสอบ QA – 005
เครื่อง Salt Spray Tester
GT7004M
1 ครั้ง / ปี
29/10/2012
31/8/2013
31/8/2014
วิธีการปฏิบัติงาน
WORK INSTRUCTION
TONGCHAI ELECTRODEPOSITION
Process: Salt Spray
Part Name: All Part
Part Number All Part
Model: All Part
ต้นฉบับ
เอกสารควบคุม

Salt 100% purity



Resulted



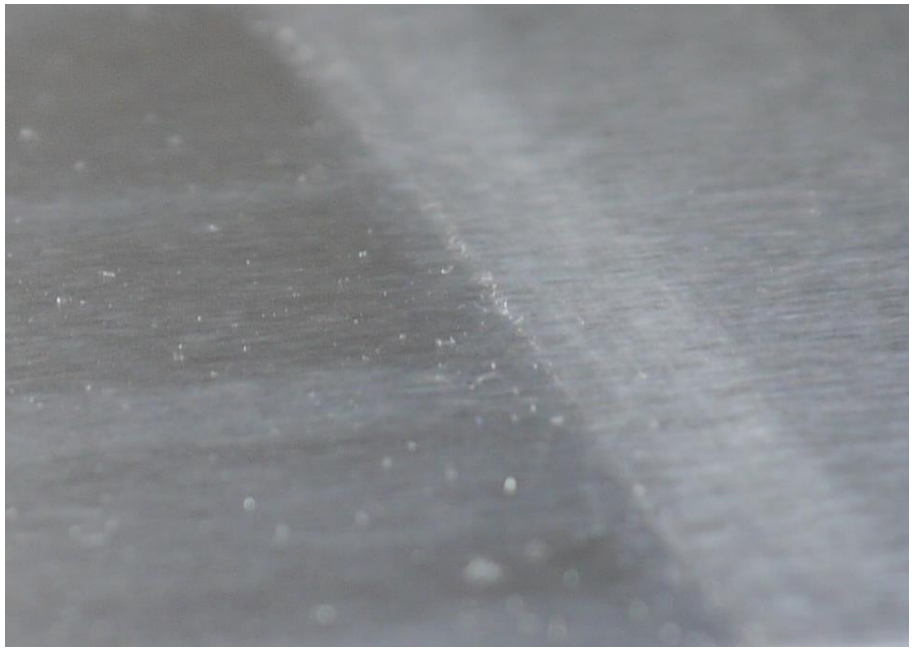
Lube-Kote 19 after 12 hrs

Meta-Shield W1000C

Meta-Shield W1000C is a water dilutable concentrate which incorporates MAT Technology.

In this form the product offers the customer the flexibility to use as they see fit, forming stable emulsions over a wide dilution range.

Meta-Shield W1000D is sold as a ready made emulsion at 22% giving optimum protection

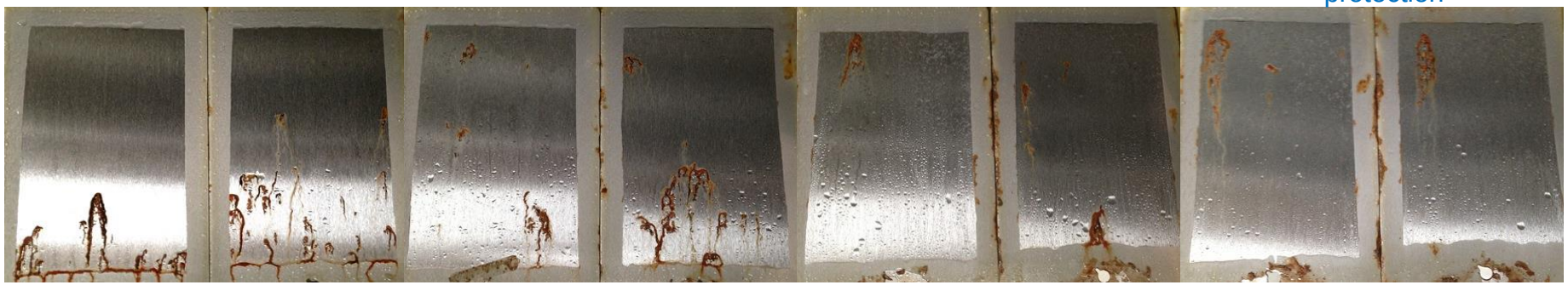


Meta-Shield W1000C

Meta-Shield W1000D

Meta-Shield W1000C

10%	15%	20%	25%
0.4µ Film Thickness	1.2µ Film Thickness	2.5µ Film Thickness	2.5µ Film Thickness
6 months indoor protection	12 months indoor protection	24 months indoor protection	>24 months indoor protection



10% after 6hrs	15% after 10hrs	20% after 28hrs	25% after 30hrs

Meta-Shield W1000C gives optimum performance when used at 20% and applied at 60ºC.

When applied hot the product evaporates faster than a solvent based product with a flash point of 60ºC

Where we offer a Technical Edge

Need for VOC free	-	Meta-Shield W1000C
		Meta-Shield WX1200
		Meta-Shield S1000, 1010, 1020
Cleaners/RP		Meta-Shield W500 4 – 10%
		Meta-Shield W1000C 5 – 15%
		Meta-Shield S600/S1000
Pressure Testing/ Hydro-Bulging	-	Meta-Shield W500
Pickling Lines		Meta-Shield PK1100/Meta-Shield W1000C
Fast Drying RP		Meta-Shield W1000C applied hot

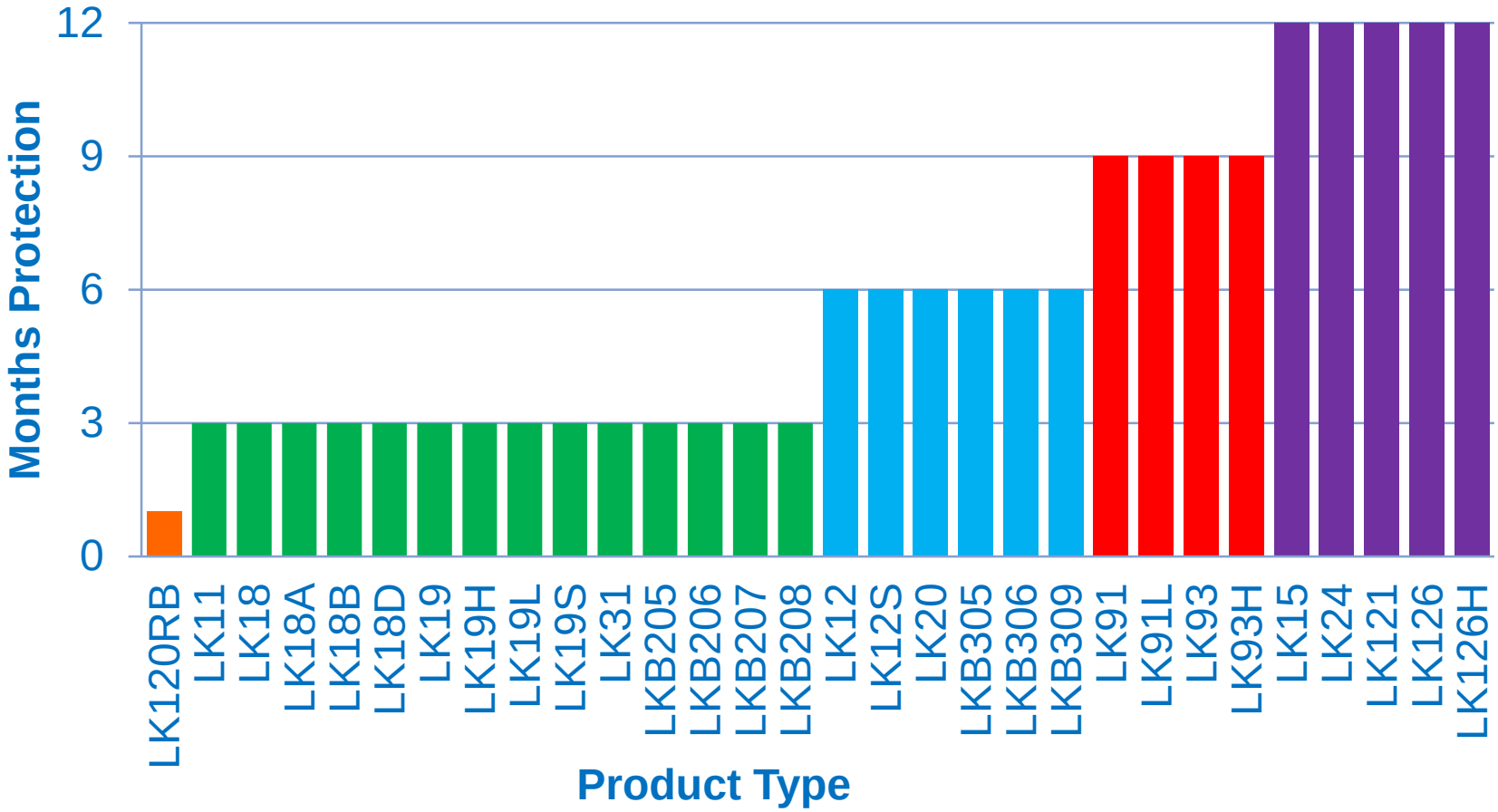
Lube-Kote Products

Solvent Base Premium Grade	Standard Grade	Short-Term
Lube-Kote 31	Lube-Kote 19	Lube-Kote 120
Lube-Kote 93	Lube-Kote 21	Lube-Kote 120AB
Lube-Kote 126	Lube-Kote 24	
Lube-Kote 189		

Water Base (Low VOC)	Appearance	Protection
Lube-Kote A235	Milky Fluid	45-90 days
Lube-Kote A222	Clear Fluid	3-7 days
Lube-Kote A912	Milky Fluid	30 days

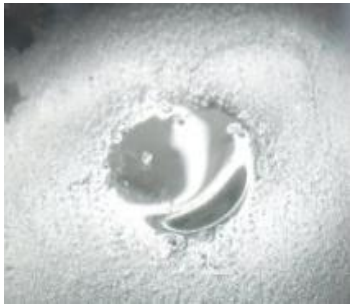
Oils Base	Appearance	Protection
Lube-Kote M85	Brown Oil Film	1-2 Years
Lube-Kote M81	Brown Oil Film	1 Year

Rust Preventive Oil Selector Chart



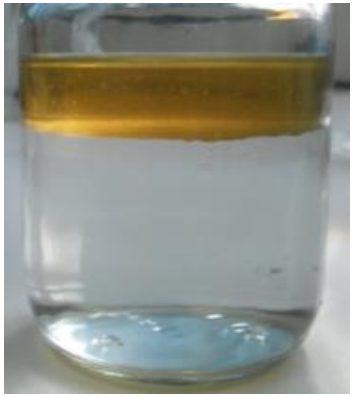
Lube-Kote 11

- Yellow and clear
- Good water separation
- Organic layer is clear
- Dry film
- 3 months protection



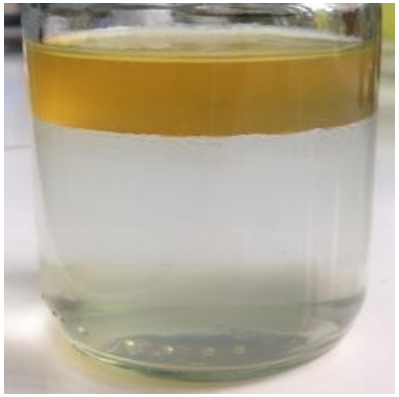
Lube-Kote 18D

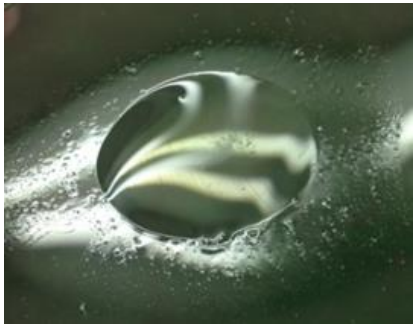
- Yellow and clear
- Good water separation
- Organic layer is slight hazy
- Little oil film
- 3 months protection



Lube-Kote 19

- Yellow and clear
- Good water separation
- Organic layer is slight hazy
- Medium oil film
- 3 months protection





Other Products

- Lube-Kote AL1
  - Solvent type spray for protection stain of aluminium diecasting
- Lube-Kote A216
  - Water soluble for Aluminium, Brass, Copper

Rust Preventive Oils

Problems	Properties	Products
Condense in Plastic Bag	Fast Evaporate	Lube-Kote 12
Poor Dull Surface	Oil Shiny Film	Lube-Kote 19
Coolant on part	Fast Water Separate	Lube-Kote 15
Strong Smell	Low smell	Lube-Kote 33
Dirty Floor	Low Oil, thin film	Lube-Kote 12S
Rust when export	Salt Protection	Lube-Kote 126

5. Monitoring Rust Preventive oils

For effective of rust preventive oils as long as desired

Lube-Kote 126 Rust Preventive Daily Monitoring- การตรวจวัดน้ำมันป้องกันสนิมเบื้องต้น ประจำวัน

ข้อที่	คุณสมบัติ	เกณฑ์การยอมรับ	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1	สี	น้ำตาล-เข้ม																															
2	ความใส	ขุ่นเล็กน้อย																															
3	ความสะอาด	สะอาด-เศษเล็กน้อย																															
4	น้ำ	ไม่มี																															
5	การแยกน้ำ	< 3 นาที																															

หมายเหตุ เครื่องหมาย / คือ ใช้งานได้, เครื่องหมาย X คือ ใช้งานไม่ได้ (เปลี่ยนถ่ายน้ำยา)

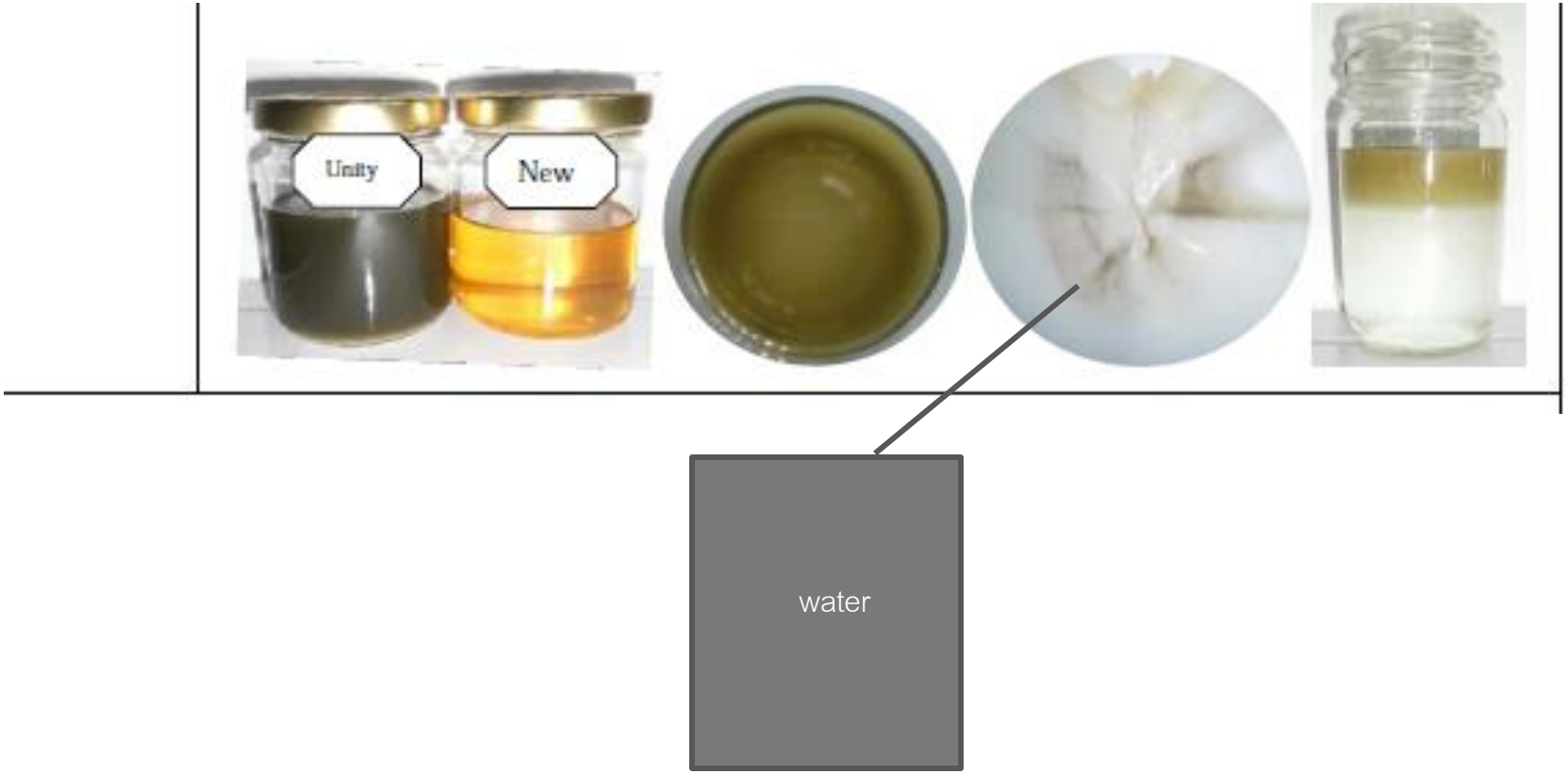
คำแนะนำในการปฏิบัติงาน

1. สวมถุงมือยางเมื่อจับชิ้นงาน
2. จุ่มชิ้นงานอย่างทั่วถึง พลิกไปมาให้สิ่งสกปรกหลุดจากชิ้นงาน
3. ตรวจดูสนิมให้ทั่วชิ้นงานและทุกกระบวนการ
4. ระวังน้ำและความสกปรก ห้ามสัมผัสกับชิ้นงานโดยเด็ดขาด
5. ให้เปิดน้ำทิ้งออกทุกวันก่อนปฏิบัติงานและก่อนเก็บตัวอย่าง (เปิดทิ้งจนน้ำใสหรือจนน้ำสะอาด)

คำแนะนำในการเก็บตัวอย่าง

A. เปิดน้ำ สิ่งสกปรกในถังทิ้งก่อน
B. ให้กวนน้ำยาในถังก่อนเก็บ
C. เก็บตัวอย่างประมาณ 3ใน 4 ของขวด
D. พักไว้ 1-3 นาที แล้วบันทึกผล
E. การแยกน้ำ (เติมน้ำ: น้ำยา = 50:50 แล้วเขย่า) จับเวลา

Water in Rust Preventive Oils



Salt Spray Test

For confirm time to protect your part

The Specialist of Rust Preventive and Metal Working Lubricants

SALT SPRAY TEST REPORT

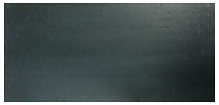
Report No. : SST1404001
Customer : [illegible]
Address : [illegible]

Test Product :	Lube-Kote 18D
Part Name :	-
Part No.:	-
Receive Date:	4/4/2014
Tested Date:	9/4/2014

Standard of Test :	ASTM B117
Test Method:	Salt Spray (Fog) Test
Salt Concentration :	5% NaCl
Chamber Temperature:	35.8 C
Time of Test:	12 hours.

Picture of Sample after Test 12 Hrs.

1. Lube-Kote 18D



Result of Salt Spray(Fog) test

Test Item	Description	Test Result
1	Lube-Kote 18D Salt Spray for 12 Hrs.	Surface : No Red Rust Appear

Report by : Patchaya Khuhatong
Date : April 11, 2014

CHS-ASIA CHEMICAL CO.,LTD.

6. Health and Safety

Generally, Substances in this group are less toxic but flammable. High volume of inhalation, such as white spirit, which is a chemical used in warm weather will cause high volume volatiles in the atmosphere. If workers inhale may cause drowsiness , headache. In addition, direct contact cause dermatitis

But Lube-Kote Series products are designed to focus on safety for the user worker in acceptable cost.

- Mild odor
- Mix Anti-mist for decrease evaporation of VOC
- No heavy metal, confirmed by RoHS report

Environmental Friendly

The solvent type we use type to save Environmental Friendly

1. NO marine Pollutant
2. N Label
3. Rhk phase
4. Mild Odor

Protection

1. Adequate ventilation to control airborne concentration below the exposure guidelines/limits
2. Wear personal protective equipment such as rubber gloves, goggles, visors, aprons, etc.

3. Annual health's check and before start. Check neurological examination, blood pressure, heart, liver, and generally symptoms such as headache, muscle pain.

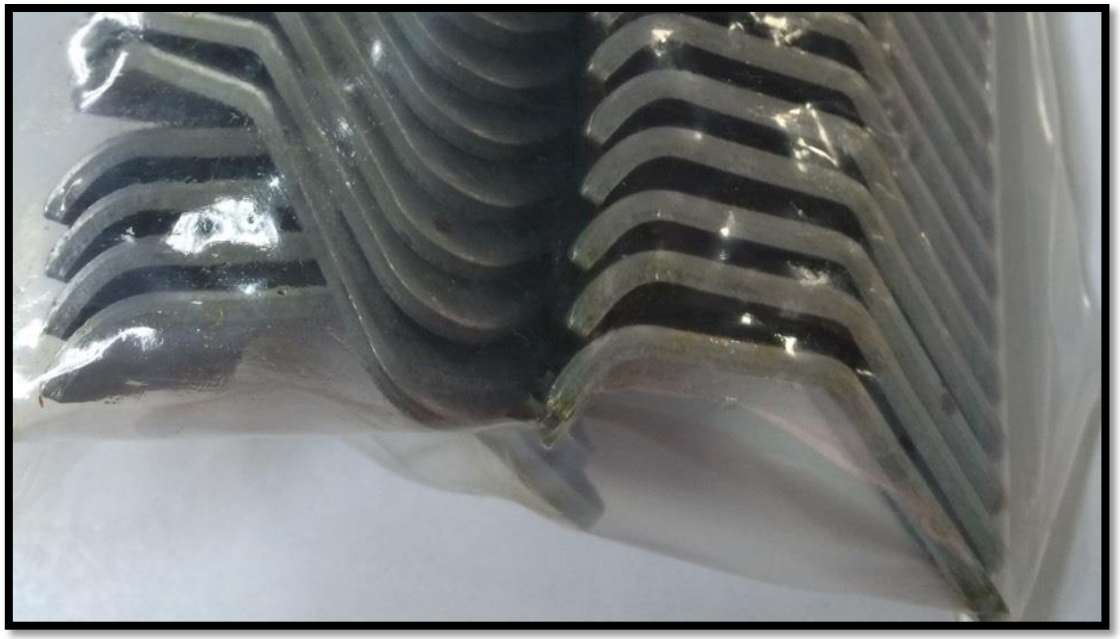
4. To have emergency shower, emergency eye wash. Training about hazardous and how to protect.

Case Study 2

Rust from chemicals and packaging

Yellow Stain

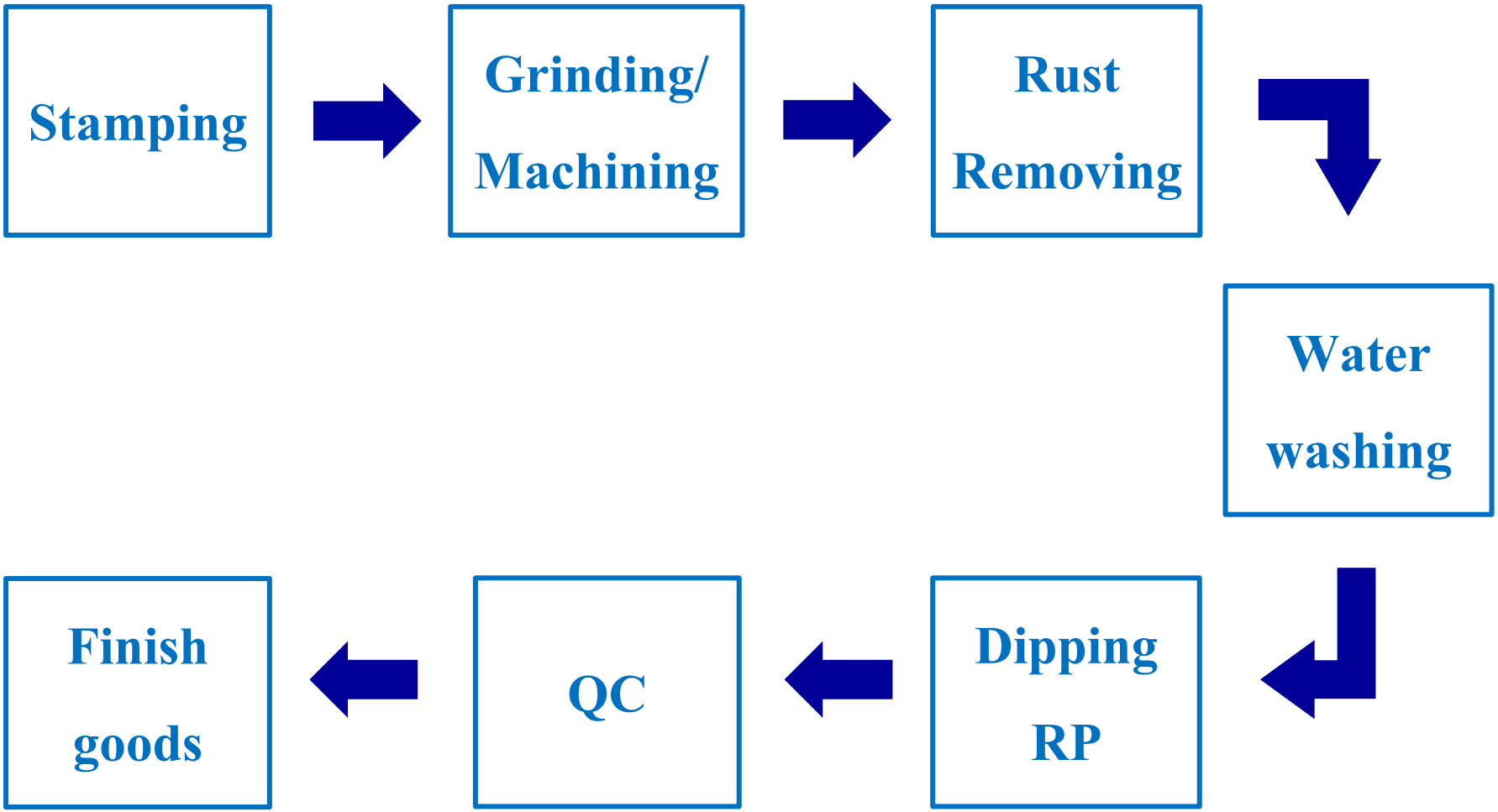
Yellow Stain



Packaging

From the picture, Lube-Kote 19 is volatiled when pack in plastic bag. While part is not dreid, thus occur condensation may cause rust.

Process



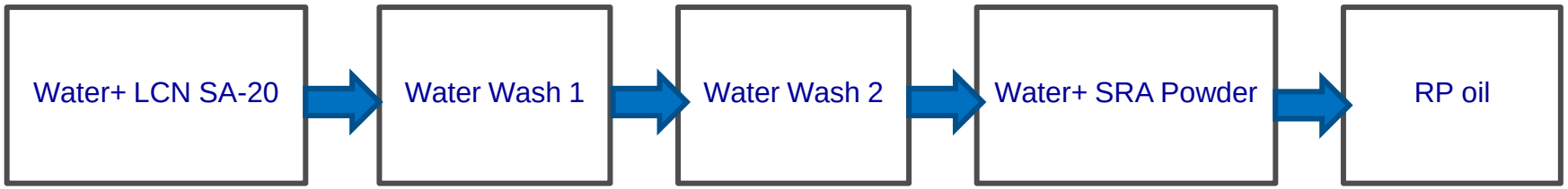
*Lube-Kote 19

Preliminary problem analysis

1. Yellow stain
   - Maybe cause of rust remover
2. Sticky part
   - Over oil in RP cause part to stick
3. Red rust
   - Lube-Kote 19 is volatiled when pack in plastic bag. While part is not dreid, thus occur condensation may cause rust.

Solution

1. Yellow stain
   - Check process, CHS-Asia recommended Lube-Clean SA20, which have stop rust agent powder for remove yellow stain



2. Sticky part
   - Waiting oil to dry
   - Use RP (dry film type)
3. Red rust
   - Waiting oil to dry before packaging, or use Lube-Kote 12 (dry film type) for quick valatile

7. Rust Remover

Lube-Clean SA20 Package

Lube-Clean SA20	25 Liters
+	
SRA Powder	200 Grams

Product name : Lube-Clean SA20

Sample test : Rust on part

Step 1 : Pour “Lube-Clean SA20” Mix Water 1:1 into box.

Step 2 : Take sample to box.

Step 3 : Waiting sample test 3-10 minute.

3 Minute.

5 Minute.

10 Minute.

Step 4 : Cleaning water 2 time.

Step 5 : Dip SRA-Powder 1 minute.

Step 6 : Dip rust preventive oil Lube-Kote 19 for protect 3 months.

Summary : Passed

Because : 1. Lube-Clean SA20 can take out rust in short time.

2. No corrosion on surface.

3. Remove stain on the part automatic.

Summary : Lube-Clean SA20 (Rust Remover)

Before	After
	

Before	After
	

Reference

AHM

PT Astra Honda Motor
Jl. Yos Sudarso, Sunter I
P.O.BOX 3009 JKT, JAKARTA - INDONESIA
Telp. : (62 21) 651 8080, 4682 2510
Fax. : (62 21) 651 8814, 4682 2521

PURCHASE ORDER

No. 4500371808
Date 10.06.2015

reference :

Messrs,

PT KARYA PANGESTU
SENTRA NIAGA KALIMALANG
BLOK A2 NO. 8 JL. AHMAD YANI
BEKASI
021-8856700
Attn. -

Please deliver to :

PT Astra Honda Motor
Jakarta
Plant Karawang

Gd Fuel - Lubric

IDR

Item	Material Number	Description	Quantity	Unit Price	Amount	Del. Time
1	06-92-00409	ANTI RUST LUBE-KOTE D18@20L/PAIL	100			24.06.2015

Thank you very much