REMINDERS ON CORROSION

- Corrosion = attack by oxidation of a metal
- Aggressive agents : water, dissolved oxygen, acids, dissolved salts (chloride)
- Electrical and chemical actions combined

WHAT IS CORROSION ?

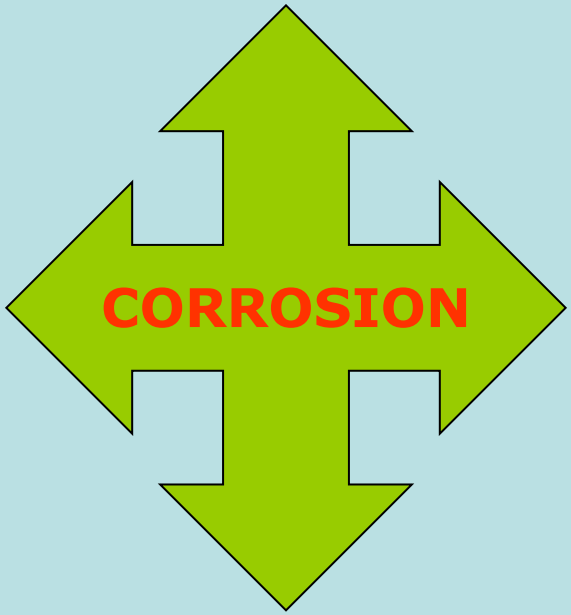
CORROSION IS A NATURAL PHENOMENOM WHICH ATTACKS METALS , WITH CHEMICAL OR ELECTROCHEMICAL ACTION AND CONVERTS IT INTO A METALLIC COMPOUND, SUCH AS AN OXIDE, HIDROXIDE OR SULPHATE

WHAT IS CORROSION ?

THE CORROSION ,OCURRS BECAUSE OF THE TENDENCY FOR METALS TO RETURN TO THEIR NATURAL STATES.

FOUR CONDITIONS MUST EXIST BEFORE CORROSION CAN OCURRS

1.- PRESENCE OF A METAL THAT WILL CORRODE (ANODE)



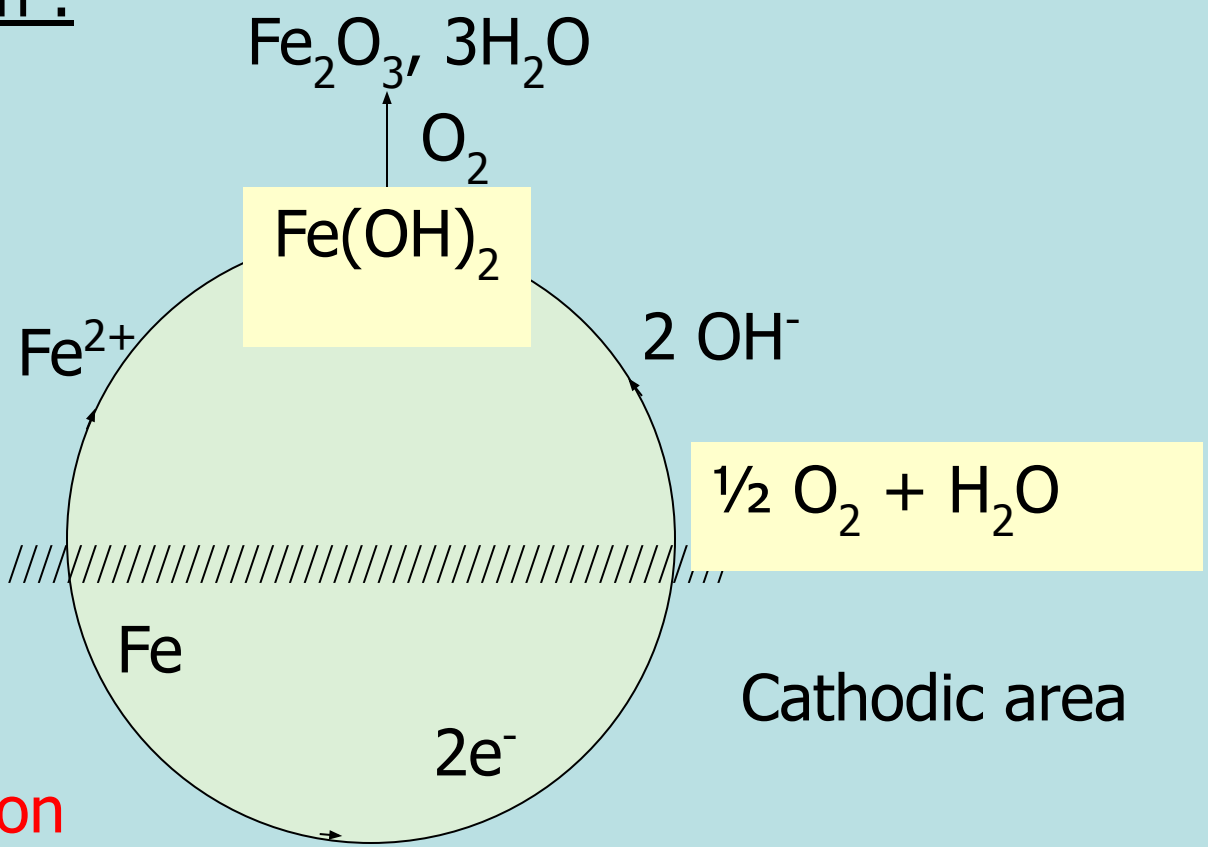
3.- PRESENCE OF A CONDUCTIVE LIQUID (ELECTROLYTE)

2.-PRESENCE OF A DISSIMILAR CONDUCTIVE MATERIAL (CATHODE) WHICH HAS LESS TENDENCY TO CORRODE

4.- ELECTRICAL CONTACT BETWEEN ANODE AND CATHODE (USUALLY METAL – METAL).

REMINDER ON CORROSION

Example of iron :



Also concerned : Aluminium, Zinc, Copper

REMINDERS ON CORROSION

- Corrosion = attack by oxidation of a metal
- Aggressive agents : water, dissolved oxygen, acids, dissolved salts (chloride)
- Electrical and chemical actions combined

Manufacturing

Packing

Application

Film formation

Problems Illustration

- Packaging damaged
- Formulation polluted

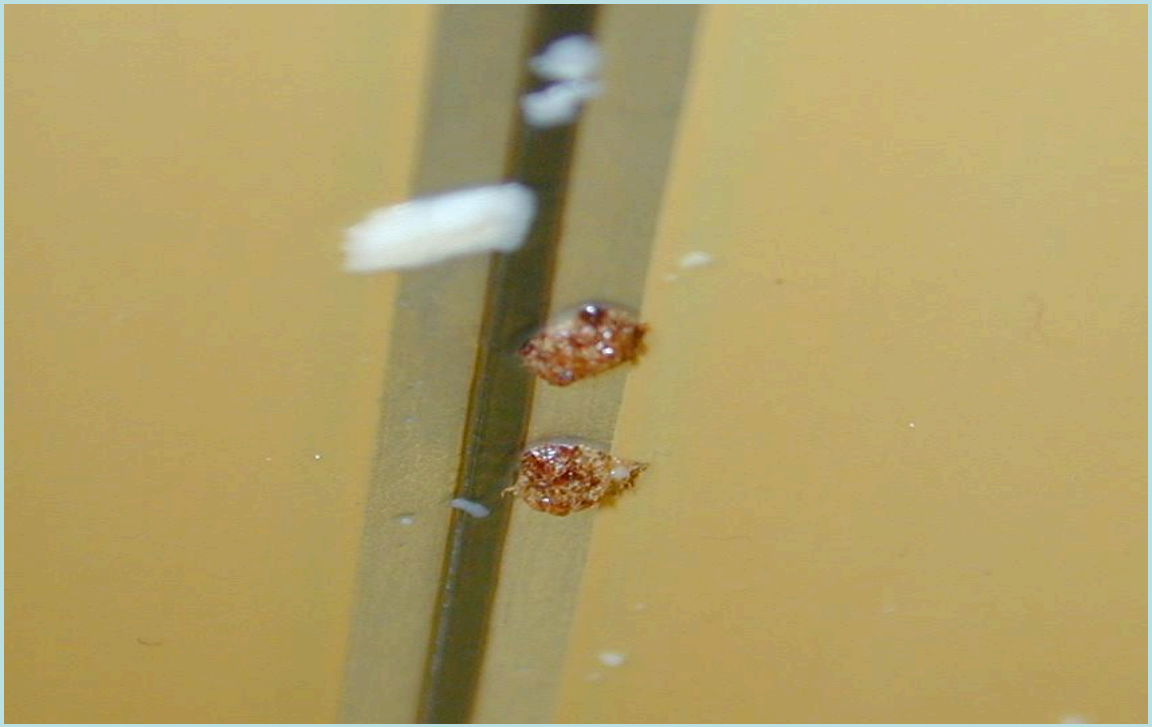
Manufacturing

Packing

Application

Film formation

Problems Illustration



Concerns also packaging varnished in the inside

- Bottom
- Weld
- Handle fixations

} critical areas

Manufacturing

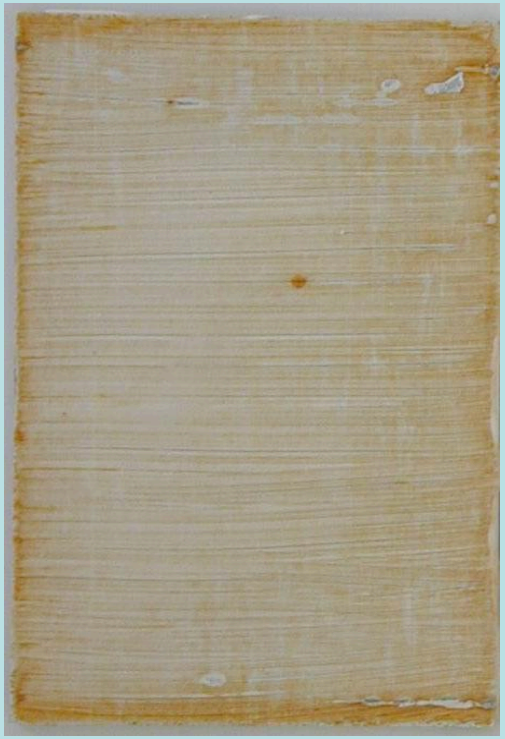
Packing

Application

FLASH-RUST

Film formation

Problems Illustration



- **Properties deterioration : adhesion loss, permeability increase**
- **Aspect degradation**

Manufacturing

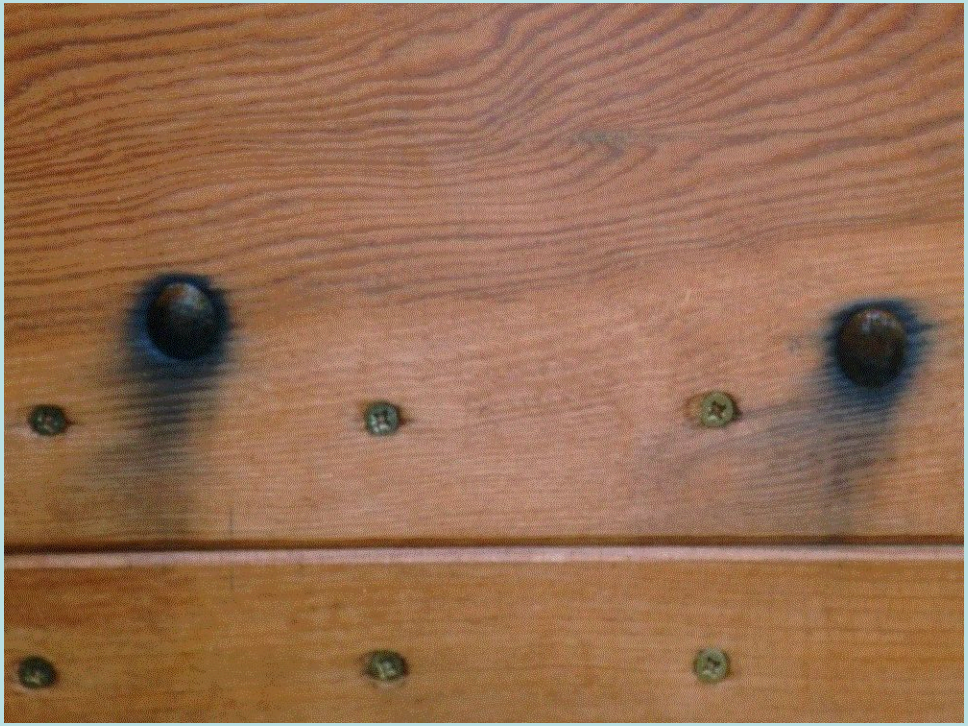
Packing

Application

FLASH-RUST

Film formation

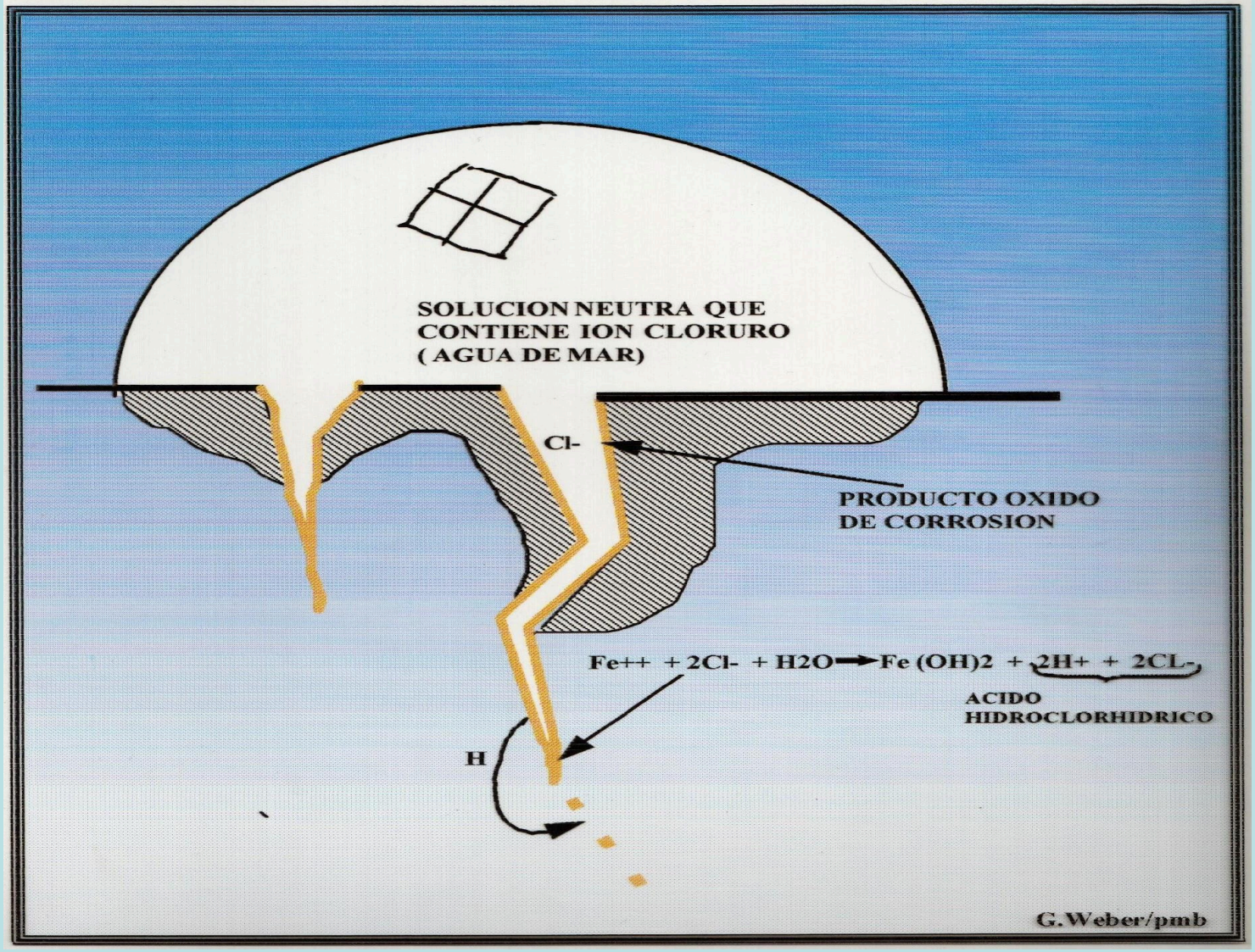
Problems Illustration



Flash rust concerns also formulations devoted to other substrates than metal

QUIMICA Y CAMBIO DE PH EN FISURA PRODUCTO DE AGUA SALADA

(ASPECTO ELECTROQUIMICO DE DELUCCIA)



EMADOX®, AB RUST® CORROSION INHIBITORS

Definition : a corrosion inhibitor is a substance which, when added **in small concentration** to an environment, effectively reduces the corrosion rate of a metal exposed to that environment.

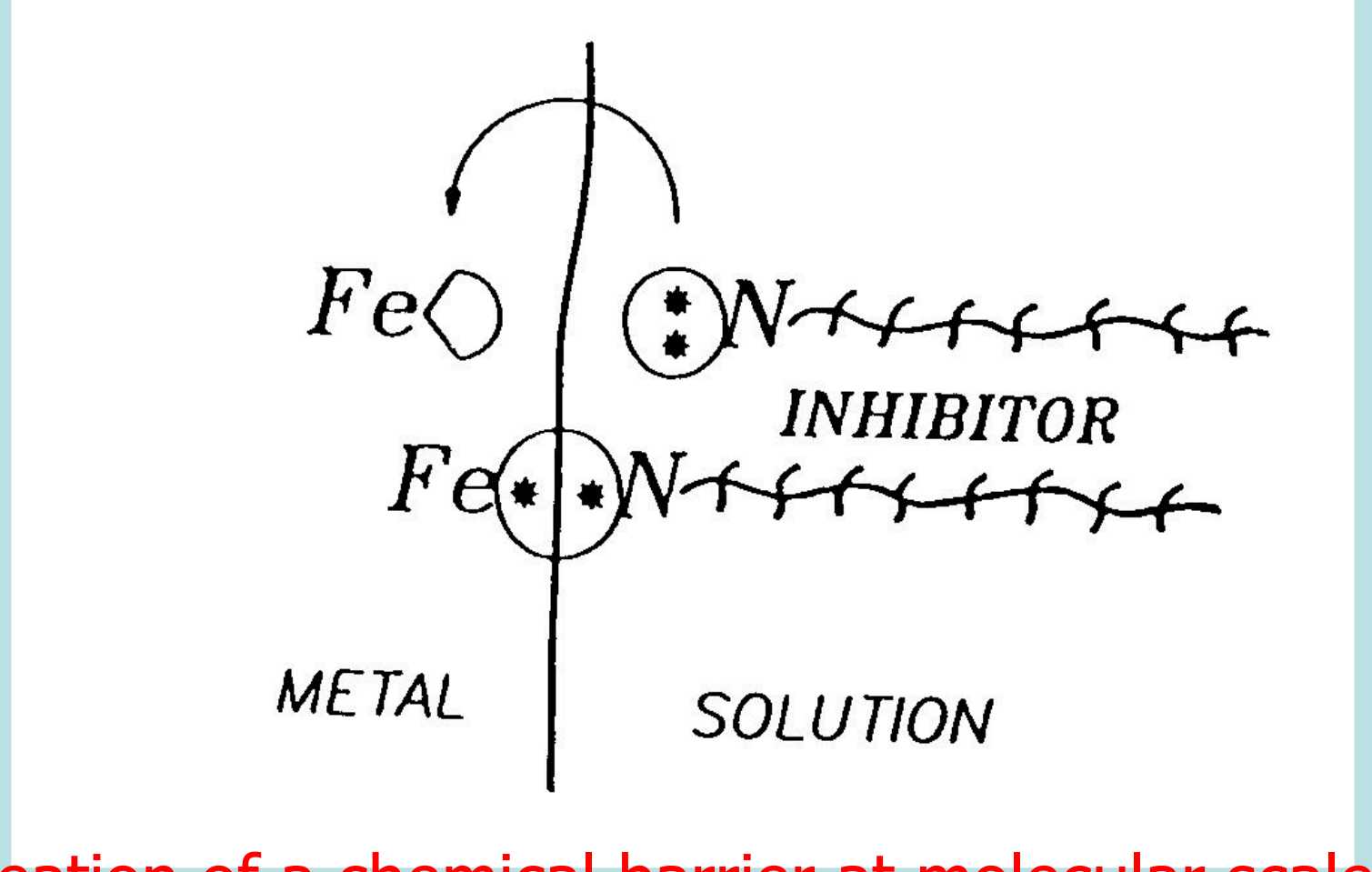
Typical use levels :0,2 to 3,0% of the total formulation weight

EMADOX®, AB RUST®
General Characteristics

- Ready to use aqueous solutions
- Associations of different active corrosion inhibitors
- REINFORCED EFFICIENCY due to synergies in ways the products operate

EMADOX®, AB RUST®

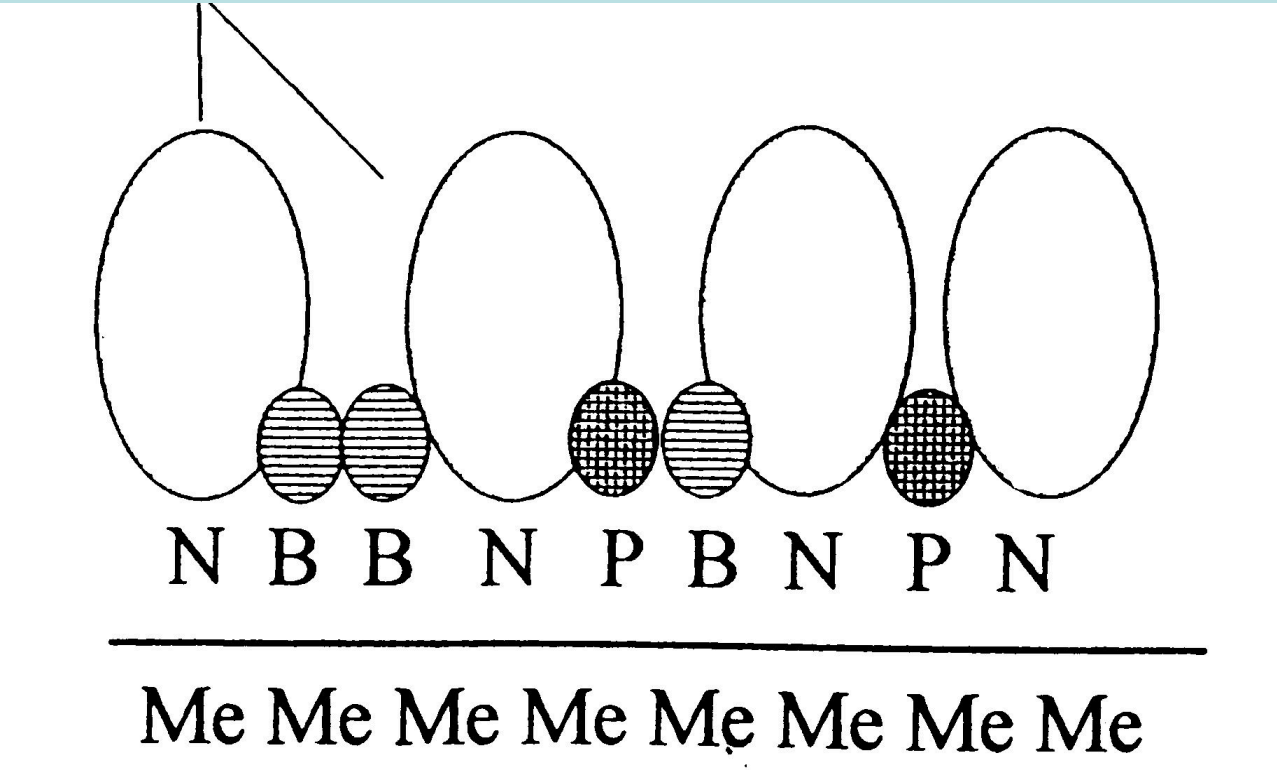
Way of action : adsorption



Creation of a chemical barrier at molecular scale

EMADOX®, AB RUST®

Way of action : Reaction with oxidised metal



Reinforcement of the passivative layer

Passivating inhibitors are considered the most efficient

EMADOX®, AB RUST®

Way of action :

- **Basic pH control**
- **Acid products neutralisation**
- **Competitive reactions with aggressive agents**

EMADOX®, AB RUST®

Direct effects

- Protective layer between the metal and the medium
- Electrical resistance increased ➡ corrosion rate reduced
- Reinforcement of the passivative layer
- Coating's adhesion improved

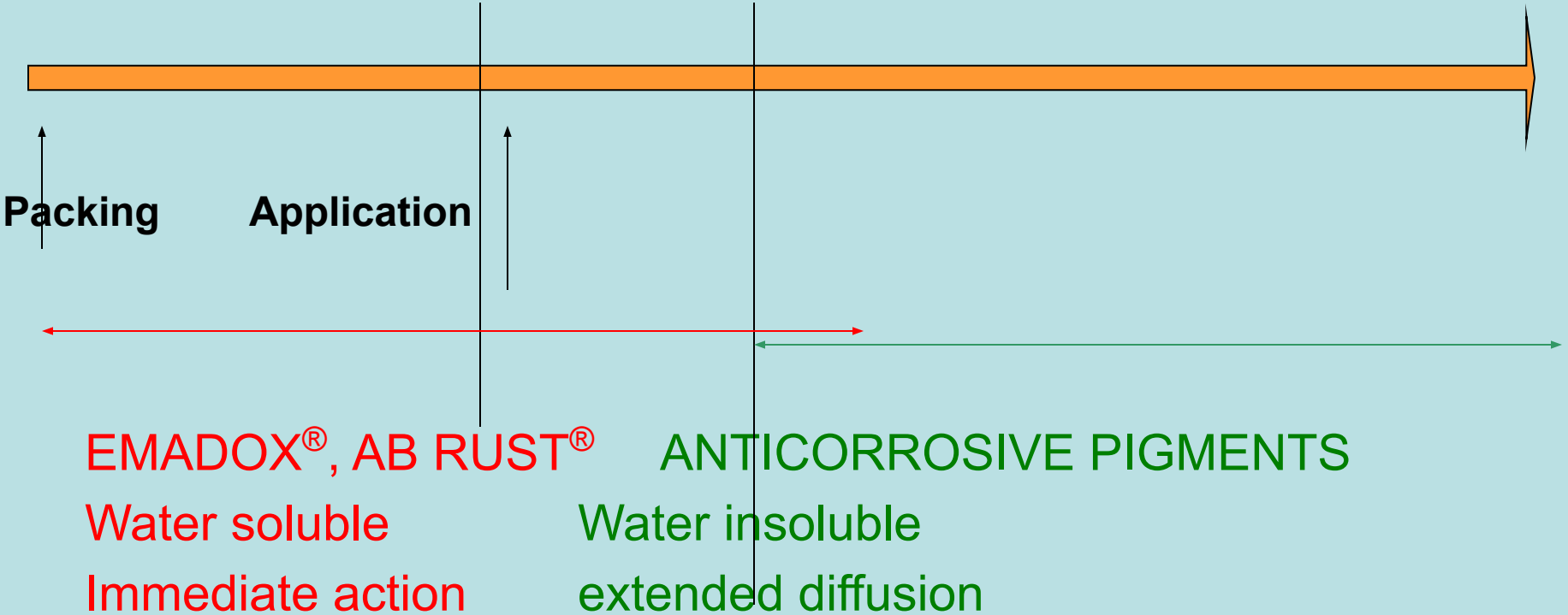
EMADOX®, AB RUST®

Incorporation in the manufacturing process：

- **Mainly in POST-ADDITION**
- **Also in the grinding stage**

EMADOX®, AB RUST® : Position compared with anticorrosive pigments

Storage **Drying** **Coating's durability**



EMADOX®, AB RUST® ANTICORROSIVE PIGMENTS

Water soluble Water insoluble

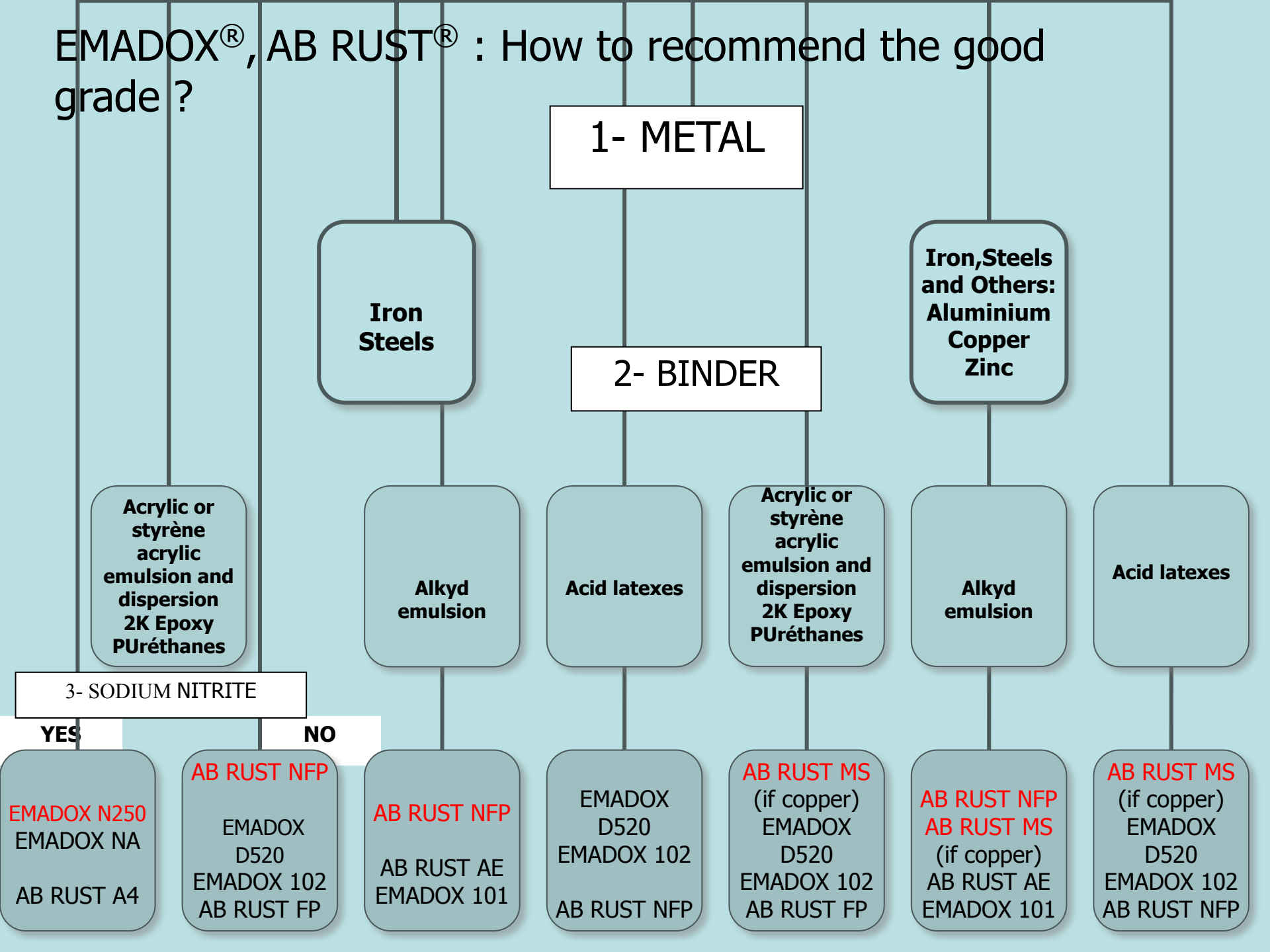
Immediate action extended diffusion

EMADOX®, AB RUST®

The rang■ recommended • possible

Application	EMADOX ®					AB RUST®				
	NA	N250	D520	101	102	A4	NFP	FP	AE	MS
Water based anti-corrosive primers and paints	■	*NEW 2006*			•	*NEW 2007*	*NEW 2006*	*NEW 2007*		
Decorative water based paints and varnishes	**See also diagram on next slide**									
Wood treatment coatings			■				■	•	■	
Multi purposes primers			•		•		■		•	■
Tinplate packaging protection			■						■	

EMADOX®, AB RUST® : How to recommend the good grade ?



Water based anti-corrosive primers and paints

- EMADOX NA

  tested in several guide formulations based on :

  - acrylic and styrene/acrylic emulsions : Acronal S760 (BASF), Neocryl XK-62 and XK-88 (NeoResins)
  - Acrylic dispersions : Enorex M1630AV
  - Vinyl acrylic latex : Haloflex 202 (NeoResins)
  - Vinyl Ester of Versatic Acid : Veocryl (Resolution Performance Products)

- USE LEVELS : typically 0,3-0,4% on the total weight

- SUBSTRATES : Iron and steel

Water based anti-corrosive primers and paints

EMADOX NA - Experience on 2K-epoxy system :

EMADOX NA added in the hardener
1,0% on the total weight of the mix are needed to stop rust

Without NA

0,5% NA
Cleaned substrate

Before

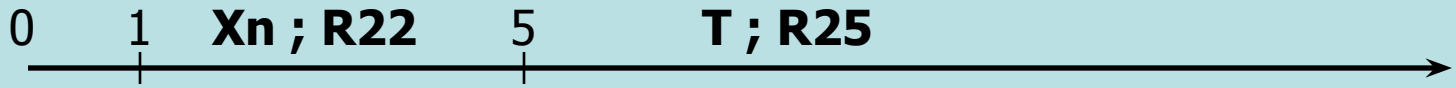
1,0% NA
Rusty substrate

After

EMADOX®, AB RUST®

Sodium nitrite case

Reminder : concentrations leading to the labelling of the final product



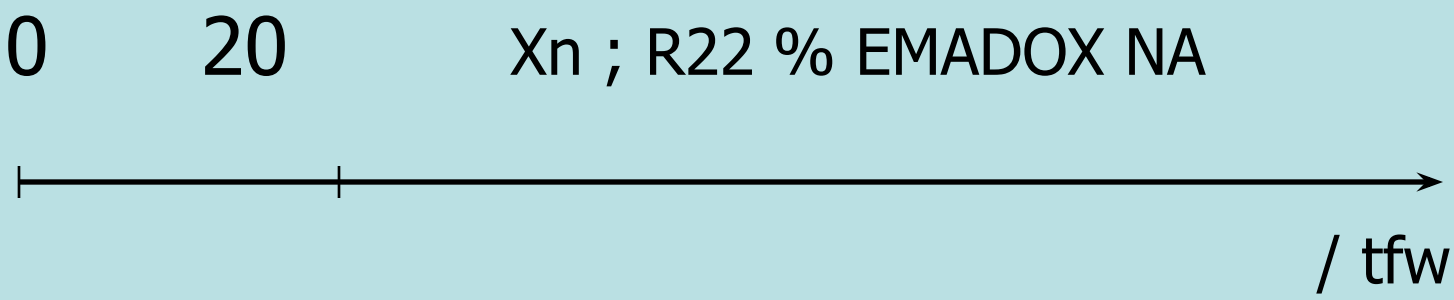
- EMADOX NA is concerned :
- NOT LABELLED - WHY ?
- LD50 evaluation made by an approved and independent laboratory
- LD50>2000 mg/kg (rat)
- EMADOX NA = PREPARATION NOT CLASSIFIED AS DANGEROUS IF SWALLOWED

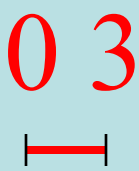
EMADOX®, AB RUST®

Sodium nitrite case

From the formulator point of view

Concentrations leading to the labelling of the final product





RECOMMENDED USE LEVELS % / tfw

Water based anti-corrosive primers and paints

- EMADOX N250 and AB RUST A4

  - Better stability of the additive at temperature below 0°C

    EMADOX N250 does not freeze

    AB RUST A4 cristallization is reversible

  - Possibility to replace EMADOX NA by improving the formulation cost

- USE LEVELS : 0,3-1,0% on the total weight

- SUBSTRATES : Iron and steel

Water based anti-corrosive primers and paints

- AB RUST NFP
  NITRITE FREE PRODUCTS

- USE LEVELS : 0,5-1,0% on the total weight

- SUBSTRATES : Iron and steel
  aluminium
  zinc

Water based decorative paints and varnishes

- EMADOX D520, 101, 102
- AB RUST NFP, FP, AE

  NITRITE FREE PRODUCTS

- USE LEVELS : 0,5-2,0% on the total weight

- SUBSTRATES : Iron and steel

  aluminium

  zinc

Water based decorative paints and varnishes

- EMADOX 101
- AB RUST AE

  NITRITE FREE PRODUCTS showing compatibility with the binders based on alkyd emulsions

- USE LEVELS : 0,5-2,0% on the total weight

- SUBSTRATES : Iron and steel
  aluminium
  zinc

Multi purposes primers

- AB RUST MS

  NITRITE FREE PRODUCTS with active material for copper and copper alloys protection

- USE LEVELS : 0,5-1,0% on the total weight

- SUBSTRATES : Copper

  Iron and steel

  aluminium

  zinc

Tinplate packaging protection

- EMADOX D520
- AB RUST AE

  acidic pH□EMADOX D520

  alcoholic mixtures, ketones □ AB RUST AE

- USE LEVELS : 0,5-1,0% on the total weight

- SUBSTRATES : Iron and tinplate boxes

SUMMARY

- HIGH EFFICIENCY REQUESTED and NITRITE ALLOWED EMADOX N250, EMADOX NA

- HIGH EFFICIENCY AND NITRITE FREE REQUESTED AB RUST NFP

- COMPATIBILITY WITH ALKYD EMULSION EMADOX 101, AB RUST AE

- IN-CAN PROTECTION EMADOX D520, AB RUST AE

EMADOX®, AB RUST®
Efficiency evaluation in paints

- Method L-AF30 :

  drying period artificially extended in humid and corrosive saturated atmosphere

COMPETITORS

LABEMA	HALOX	SERVO DELDEN BV	ASCOTEC
EMADOX NA AB RUST AT	HALOX FLASH X 150	SER-AD FA 179	ASCOTRAN S ASCOTRAN H9
EMADOX 101 EMADOX 102 EMADOX 103 AB RUST CM EMADOX D520 EMADOX BBA EMADOX BBC	HALOX 510 HALOX 515 HALOX 520 HALOX 570 (ex IRGACOR 1405) HALOX FLASH X 350 (ex IRGACOR 252FC) HALOX 650 HALOX 415	SER-AD FA 379 SER-AD FA 579	ASCOTRAN + ASCOTRAN E ASCOTRAN L ASCOTRAN G
EMADOX NB	HALOX FLASH X 330		

Muchas gracias por su atención

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