

RAYSTON SPRAY



WHO WE ARE ?

OUR COMPANY



**WE DEVELOP AND PRODUCE
POLYURETHANE, POLYUREA AND
POLYASPARTIC SYSTEMS FOR USE
IN FLOORING / WATERPROOFING**

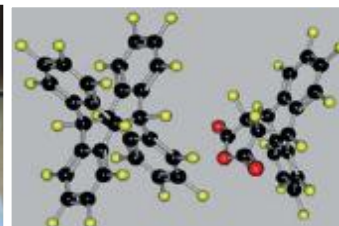
OUR BRAND



**WE TRAIN AND
COLLABORATE WITH
COMPANIES SPECIALISED IN
THE APPLICATION OF THESE
SYSTEMS, AND PROMOTE
THEM THROUGH SPECIFIERS**

Main strengths

- ü **Integration** into **one production site** of the different processes :
 - § Resin synthesis and polymerisation.
 - § Finished products formulation.
 - § Conditioning of specialties for many different applications..
- ü **Competitive** in **costs** and **flexible** to satisfy very diverse needs for our customers.
- ü Ensuring a **high degree of quality** in all our products.
- ü **Innovating** in materials and processes to provide **solutions on site**, executed by **approved installers**.



Some jobs executed:

**Les Arenes – Barcelona conversion into commercial area.
System Impermax Strat (Built-up Waterproofing/Insulation).
Arq. Richard Rogers / Alonso Balaguer**



Some jobs executed:



**New terminal building Alicante airport.
System Impermax Basic.
Arq. Bruce Fairbanks**



Some jobs executed:



**Barcelona Airport
Refurbishment of pre-boarding areas
Impermax Plus System
Arq. Ineco Ing.**



Some jobs executed:



**New water treatment plant
Lugo
Impermax Aqua System**





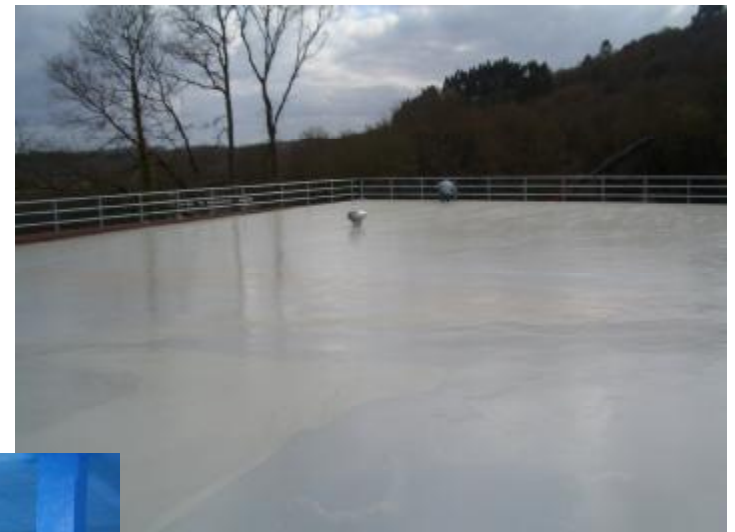
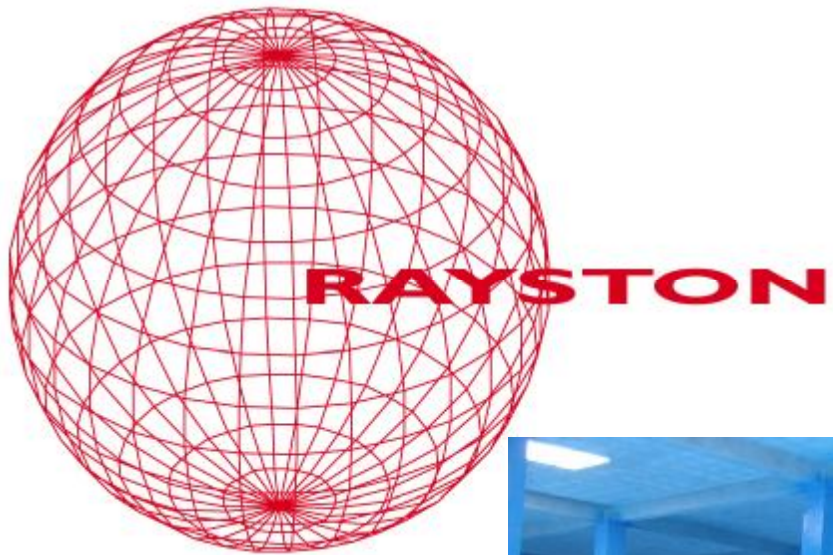
QUALITY ASSURANCE



QUALICONSULT



THE USE OF POLYUREA IN THE REFURBISHMENT OF WATER TANKS.



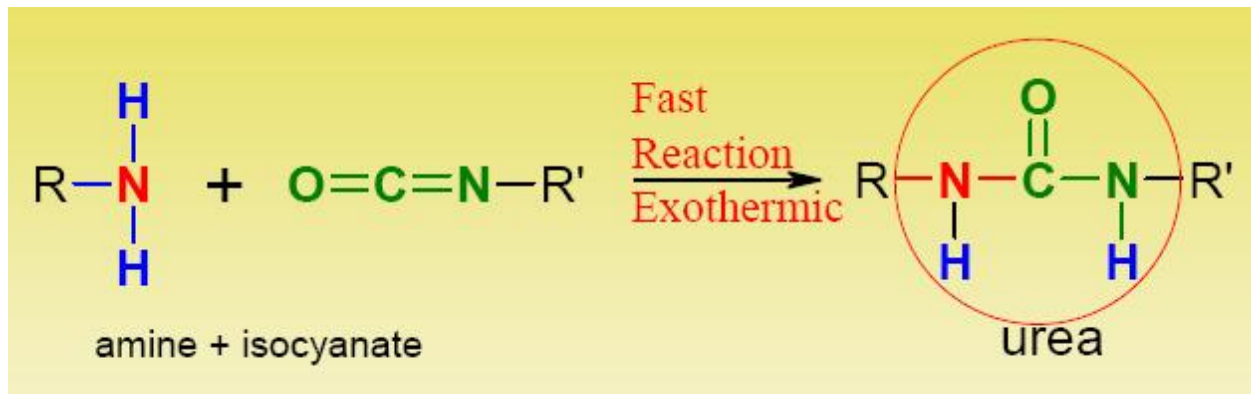
INDEX

- WHAT IS POLYUREA ?
- TRADITIONAL SYSTEMS USED IN THE REFURBISHMENT OF WATER TANKS
- WHY POLYUREA IS A BETTER SOLUTION (Certification).
- CONCLUSIONS.



CHEMISTRY OF POLYUREA ELASTOMERS

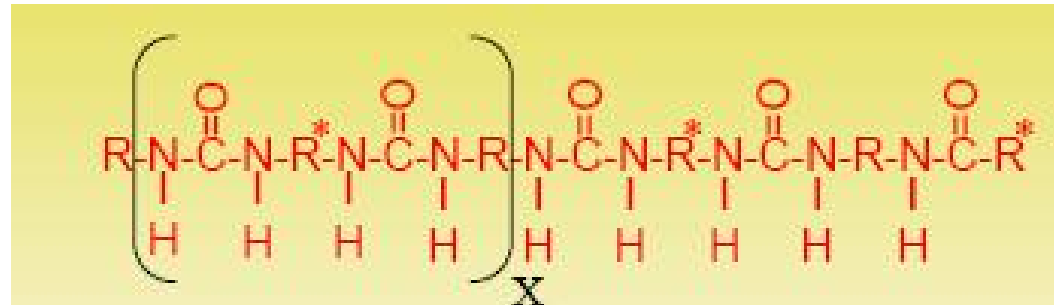
Polyurea Formation - Reaction of an Isocyanate Group with an Amine



The reaction of an **isocyanate** group with an **amine** group to form a **urea** group. This reaction is very fast and a catalyst is not typically used.

Multiple reactions (poly = many) cause the formation of a polyurea.

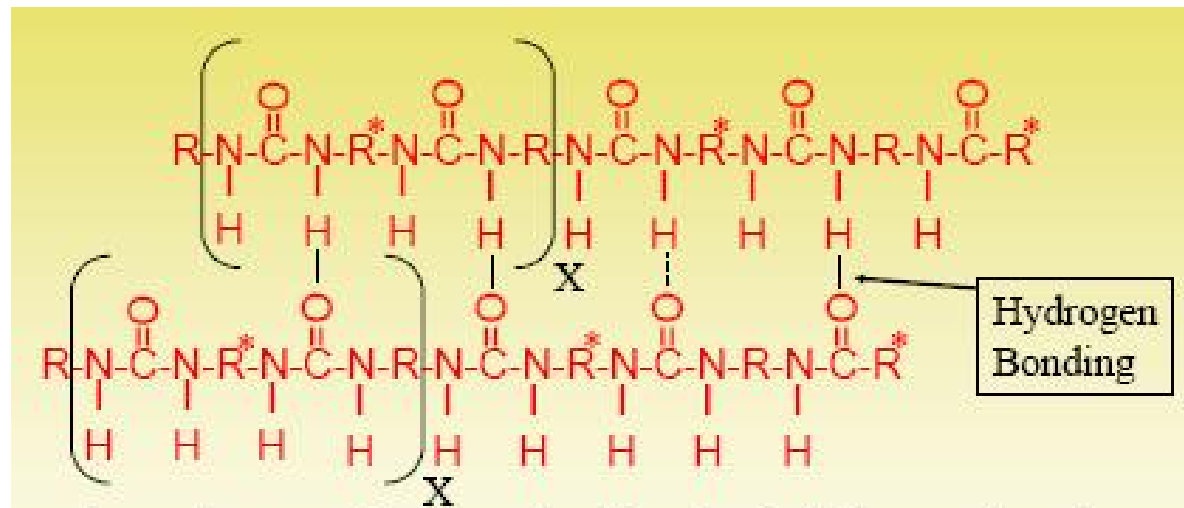
POLYUREA POLYMER STRUCTURE



Increased amount of H-bonding...(or increased hard block)

- Increased strength
- Increased solvent resistance
- Higher modulus at higher temperatures
- Hydrogen bonds act like pseudo crosslinks
- Lower molecular weight between crosslinks

POLYUREA POLYMER STRUCTURE



Polyurea has more hydrogen bonding than hybrids or polyurethanes
Typically separate into domains – i. e. phase separation

ATTRIBUTES OF POLYUREA

- Cures rapidly under most conditions and temperatures
- Low crosslink density leads to flexible products (excellent crack bridging capabilities)
- Low crosslink density and flexible backbone structure leads to high elongation products for the final product
- Low crosslink density and high hydrogen bond content gives excellent solvent resistance
- Not as sensitive to humidity or moisture as hybrids or polyurethanes

PDA'S DEFINITION OF POLYUREA

- Coating / elastomer of polyurea

A **pure polyurea** coating / elastomer is derived from the reaction product of a polyisocyanate component and an amine terminated resin blend.

REFURBISHMENT OF WATER TANKS

- There is a big demand for water tank refurbishment in most countries.
- Many infrastructures date from 1970s (or before) and require maintenance.
- Loss of water is a problem, as well as tank further degradation due to chlorine damage to steel reinforcement and stressing strands which may lead to structural failure.

REFURBISHMENT OF WATER TANKS



Tank structure may develop extensive leaks in the walls through the joints between the planks, and due to extensive cracking in the walls happening over years leading to a significant loss of treated water.



REFURBISHMENT OF WATER TANKS



Fracture & splitting

REFURBISHMENT OF WATER TANKS



Frozen leaking water may lead to fracturing and splitting to occur to the external face of the tank

REFURBISHMENT OF WATER TANKS



Roof slabs may have extensive cracking, leaking untreated water into the tank and leading to further deterioration as water freezes into fissures.

REFURBISHMENT OF WATER TANKS

Key considerations in choosing a repair system:

- Fast curing to enable the reservoir to be filled with minimal down time.
- Certified to EU standards in regards to storage of drinking water.
- Sufficient elasticity to withstand the expansion and contraction of the joints and cracks as the tank is filled and emptied, and due to thermal movement.
- Products that can be applied to the existing structure with minimal repair work and preparation to the existing structure.

REFURBISHMENT OF WATER TANKS

ALTERNATIVE SYSTEMS: CEMENTITIOUS MEMBRANES.



REFURBISHMENT OF WATER TANKS

ALTERNATIVE SYSTEMS: LIQUID APPLIED PUs / EPOXIES.



REFURBISHMENT OF WATER TANKS

ALTERNATIVE SYSTEMS: LINERS.



REFURBISHMENT OF WATER TANKS

ALTERNATIVE SYSTEMS:

SYSTEM	PROS	CONS
FLEXIBLE CEMENT MORTAR	Cheap materials Easy to use	Labour intensive No elasticity (just flexible) Does not cope with movements in joints Subject to quality of mix / sand Needs external reinforcement (mesh)
LIQUID membranes Pus / EPOXY	Have elasticity (PUs) Relatively cheap/ Easy to use	Require many layers (normally) Labour intensive Needs external reinforcement (mesh) Lengthy process (cure times).
Liners EPDM/PVC	Fast and clean to lay Works independently from structure (separated)	Requires 'specialist' to make to size. Normally difficult to make round shapes. Complex treatment of details May collapse when tank is empty (need fastening)
Hot Spray Applied Polyurethane / Hybrids	Cheaper than Polyurea	Requires totally dry area (may foam) Lower chemical resistance

ASSUMING ALL HAVE POTABLE/DRINKING WATER CERTIFICATION

CERTIFICATION

**EVERY PRODUCT / SYSTEM MUST BE APPROVED FOR USE
WITH DRINKING / POTABLE WATER AS PER:**

EEC DIRECTIVE 98/83/CE

EVERY COUNTRY APPLICATION OF SUCH DIRECTIVE

In Spain (R.D. 140/2003).

CERTIFICATION

Drinking Water Directive

The Drinking Water Directive (DWD), Council Directive 98/83/EC,

* Sets quality standards for drinking water quality at the tap (microbiological, chemical and organoleptic parameters) and the general obligation that drinking water must be wholesome and clean,

* Obliges Member States to regular monitoring of drinking water quality and to provide to consumers adequate and up-to-date information on their drinking water quality.

* Member States may exempt water supplies serving less than 50 persons or providing less than 10 m³ of drinking water per day as an average and water in food-processing undertakings where the quality of water cannot affect the wholesomeness of the foodstuff in its finished form.



http://ec.europa.eu/environment/water/water-drink/index_en.html

CERTIFICATION

CERTIFICATION EXAMPLE: RAYSTON POLYUREA.

Consumo

LGAI TECHNOLOGICAL CENTER, S.A.
Consumo LAB
C/O: 86 Access a la Universitat de Medicina, s/n
08193 Bellaterra (Barcelona)
Tf.: 93 5672000 Fax: 93 5672001

Applus⁺

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REPORT Nº: 928/10/1079

Nº. OF RECORD: 010

TEST REPORT ISSUED BY LGAI TECHNOLOGICAL CENTER, S.A.

CUSTOMER IDENTIFICATION DATA:

NAME: ORYPTON OABECK, S.L.
CENTER:
ADDRESS: P.LLAS TAPES, C/MARTI FRANQUES 12

CITY: HOSPITALET DE L'INFANT
PROVINCE: C/30 TARRAGONA
COUNTRY: ESPAÑA

SAMPLE IDENTIFICATION DATA:

PRODUCT: HOT PROJECTED POLYUREA
SUPPLIER:
BRAND:
BATCH:
CATEGORY:
REMARKS: SENT BY CUSTOMER

PACKING DATE:
EXP. DATE:
PRODUCT T.M.:
YOUR REFERENCE:

SAMPLE TAKING DATE:
RECEPTION DATE: 24/03/10
RUE YOUR
SECTION:

PHYSICO-CHEMICAL ANALYSIS

Start 24/03/10 End 24/03/10

Characteristics of materials

Parameter	Results	Legislative Norm
1 Migration of materials in contact with drinking water	Completed	

Control of content

Parameter	Results	Legislative Norm
2 Turbidity (UNT)	0,6	<=5
3 Ammonia (mg/l)	<0,5	<=0,5
4 Total Organic Carbon (TOC) (mg/l)	24,2	No changes
5 Cyanides (µg/l)	<5,0	<=10
6 Combined residual chlorine (mg/l)	<0,5	<=2
7 Residual free chlorine (mg/l)	<0,5	<=1
8 pH (pH)	6,8	>=6,5 <=9,5
9 Merbom (mg/l)	<0,5	<=0,5
10 Oxidizability (mg O ₂ /l)	1,8	<=5
11 Sulfate (mg/l)	1,6	<=300
12 Chlorides (mg/l)	3,8	<=250
13 Fluorides (mg/l)	<0,1	<=1,5
14 Nitrites (mg/l)	<0,5	<=10
15 Sulphates (mg/l)	<1,0	<=250
16 Aluminium (Al) (µg/l)	4,0	<=200
17 Antimony (Sb) (µg/l)	<2,0	<=5
18 Arsenic (As) (µg/l)	<2,0	<=10
19 Boron (B) (mg/l)	<0,1	<=1

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REPORT Nº: 928/10/1079

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PHYSICO-CHEMICAL ANALYSIS

Start 24/03/10 End 24/03/10

20 Cadmium (Cd) (µg/l)	<1,0	<=5
21 Copper (Cu) (mg/l)	<0,1	<=2
22 Chromium (Cr) (mg/l)	<2,0	<=50
23 Iron (Fe) (µg/l)	<10,0	<=200
24 Manganese (Mn) (µg/l)	<2,0	<=50
25 Mercury (Hg) (µg/l)	<0,2	<=1
26 Nickel (Ni) (µg/l)	<2,0	<=20
27 Lead (Pb) (µg/l)	<2,0	<=25
28 Selenium (Se) (µg/l)	<2,0	<=10
29 Volatile organic compounds		
1,2 Dichloroethane (µg/l)	<0,5	<=5
Trichloroethane + Tetrachloroethane (µg/l)	<1,0	<=30
30 Trihaloethanes (µg/l)	6,0	<=100
31 Benzene (µg/l)	<0,5	<=1
32 Polycyclic Aromatic Hydrocarbons		
Benzopyrene (µg/l)	<0,01	<=0,01
Sum of Polycyclic Aromatic Hydrocarbons (µg/l)	<0,1	<=0,1
33 Pesticides		
Aldes (µg/l)	<0,01	<=0,03
Deltam (µg/l)	<0,01	<=0,03
Heptachlorine (µg/l)	<0,01	<=0,03
Heptachlorine epoxide (µg/l)	<0,01	<=0,03
Individual pesticide (µg/l)	<0,01	
Total pesticides (µg/l)	<0,30	<=0,5
34 Acrylonitrile (µg/l)		<=0,1
First migration (µg/l)	<0,1	<=0,1
35 Isocyanohdrene (µg/l)	<1,0	<=1

Product Features

Parameter	Results	Legislative Norm
36 Conductivity (µS/cm)	<20,0	<=250
37 Resour: Dilution rate	1	<=3
38 Colour (mgPt/Co)	<1,0	<=15
39 Colour: Dilution rate	1	<=3
40 Reaction at 20 ppm chlorine	No changes	No Changes

CERTIFICATION

CERTIFICATION EXAMPLE: RAYSTON POLYUREA.

Consumo

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REPORT Nº: 928/18/1879

TEST REPORT ISSUED BY LGAI TECHNOLOGICAL CENTER, S.A.

PHYSICO-CHEMISTRY DEPARTMENT:

Note: N. D. = Not Detected. The detection limit for the technique used is 1 µg/l

According to Annex I of Royal Decree 140/2003, the maximum limit set for perchloroethylene is 0.3 µg/l. Mass Gas Chromatography is the technique used to determine this parameter. Even with the best possible optimization, this technique does not enable reaching a detection limit lower than 1 µg/l.

The parameter determination, except for the migration at the reaction at 20 ppm of chlorine, has been carried out at a collaborating Laboratory, under record number 702.791.

Migration for polymeric materials:

-Extraction means: Chlorinated water containing 1 ppm chlorine.

-Migration Temperature: 40°C.

-Contact time: The sample is washed several times, as instructed in Standard EN-12673.

Next, three 72-hour cycles are performed, thereby obtaining three testing samples.

Parameters are analysed during the initial 72-hour cycle; only the parameters that are beyond the limits of RD 140/2003 in the first cycle are repeated in the second and third cycle.

-Volume of the sample: 1 litre for each of the 72-hour cycles.

-Contact surface: 500 cm².

-Surface/volume ratio: 500 cm²/l.

CONCLUSION

The material is consistent, with the parameters analysed, with the requirements of the Royal Decree 140/2003. Although no perchloroethylene has been detected, it should be mentioned that its detection limit is higher than the one stated, since the technique used does not allow reaching a detection limit lower than 1 µg/l.

No chemical reaction product observed at 20 ppm of chlorine, the product complies with respect to this parameter with the requirements of Royal Decree 140/2003.

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English translation of the original in Spanish 9289098925

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REPORT Nº: 928/18/1879

TEST REPORT ISSUED BY LGAI TECHNOLOGICAL CENTER, S.A.

Department Manager Inorganic Chemistry
Eskal Garroviña Arsu
Bellaterra, 25th of March of 2018

LGAI Technological Center, S.A.
Escal Garroviña Arsu

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In the framework of our improvement programs, we would appreciate any comments you may deem appropriate. These should be addressed to the manager who signs this document, or to the Quality Director of Applus+ at the following address: satisfaccion.cliente@applus.com.

CERTIFICATION

CHEMICAL RESISTANCE: RAYSTON POLYUREA.

	JET fluel A1	Biodiesel	Skydrol	10% HNO3	20% HNO3	5% HCl	10% H2SO4	20% H2SO4	10% NaOH	20% NaOH	Hypochloride
1 wk	no change	minor change	medium change	medium change	medium change	medium change	no change	no change	no change	no change	no change
2 wk	no change	minor change	medium change	medium change	medium change	medium change	no change	no change	no change	no change	no change
3 wk	no change	minor change	medium change	medium change	medium change	medium change	no change	no change	no change	no change	no change
4 wk	no change	minor change	medium change	medium change	medium change	medium change	no change	no change	no change	no change	no change
6 wk	no change	minor change	medium change	medium change	medium change	medium change	no change	no change	no change	no change	no change
9 wk	no change	minor change	medium change	medium change	medium change	medium change	no change	no change	no change	no change	no change
12 wk	no change	minor change	medium change	medium change	medium change	medium change	no change	no change	no change	no change	no change
16 wk	no change	minor change	medium change	medium change	medium change	medium change	no change	no change	no change	no change	no change
20 wk	no change	minor change	medium change	medium change	medium change	medium change	no change	no change	no change	no change	no change



APPLICATION OF POLYUREAS

(in the refurbishment of water
tanks)

STEP 1: PREPARATION.

SUBSTRATES MUST BE CLEAN AND FREE OF DUST, ORGANIC RESIDUE, DIRT, etc. and EVEN (FREE OF HOLES).

CLEANING OPTIONS:

**HIGH PRESSURE WATER (then dry with air)
MECHANICAL / DRY PROCESSES (GRINDING).**



Note: on contaminated / ruinous substrates it is possible to spray on Geotextiles as a seamless liner.

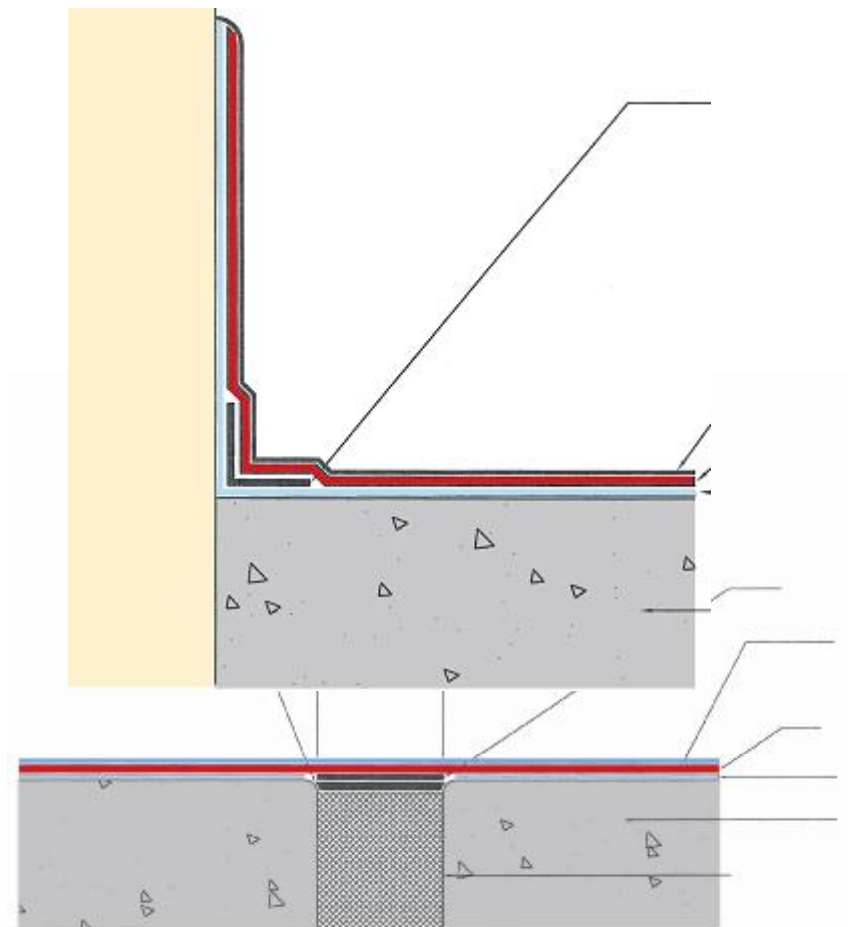
STEP 2: PRIMING/SEALING.

- IT IS IMPORTANT TO SEAL CONCRETE BEFORE SPRAYING.
- POLYUREA SHOULD NOT BE APPLIED ONTO MOIST / HUMID SUBSTRATES (AVOID BLISTERING/DE-BONDING).
- PRIMERS SHALL BE ALLOWED TO CURE ENOUGH / NOT TOO MUCH (CRYSTALLISATION).
- WATER BASED PRIMERS MUST ENSURE WATER IS TOTALLY GONE.
- IT MAY BE NECESSARY TO APPLY PRIMER IN 2 OR MORE COATINGS IN ORDER TO SEAL SUBSTRATE TOTALLY.
- ADVISE: THROW SAND IF THERE IS A CHANCE THAT PRIMER MAY CRYSTALLIZE.



STEP 3: DETAILS.

- POLYUREAS MUST BE APPLIED AS PER SUPPLIERS INDICATIONS CONCERNING TREATMENT OF DETAILS AND CRITICAL POINTS.
- IT IS KEY TO ALLOW FOR ELASTOMER MOVEMENT IN MOST CRITICAL AREAS / SPOTS.
- FISSURES/CRACKS SHALL BE PREPARED WELL BEFORE SPRAYING ON THEM, ENSURING THICKNESS IS AS HOMOGENEOUS AS POSSIBLE.



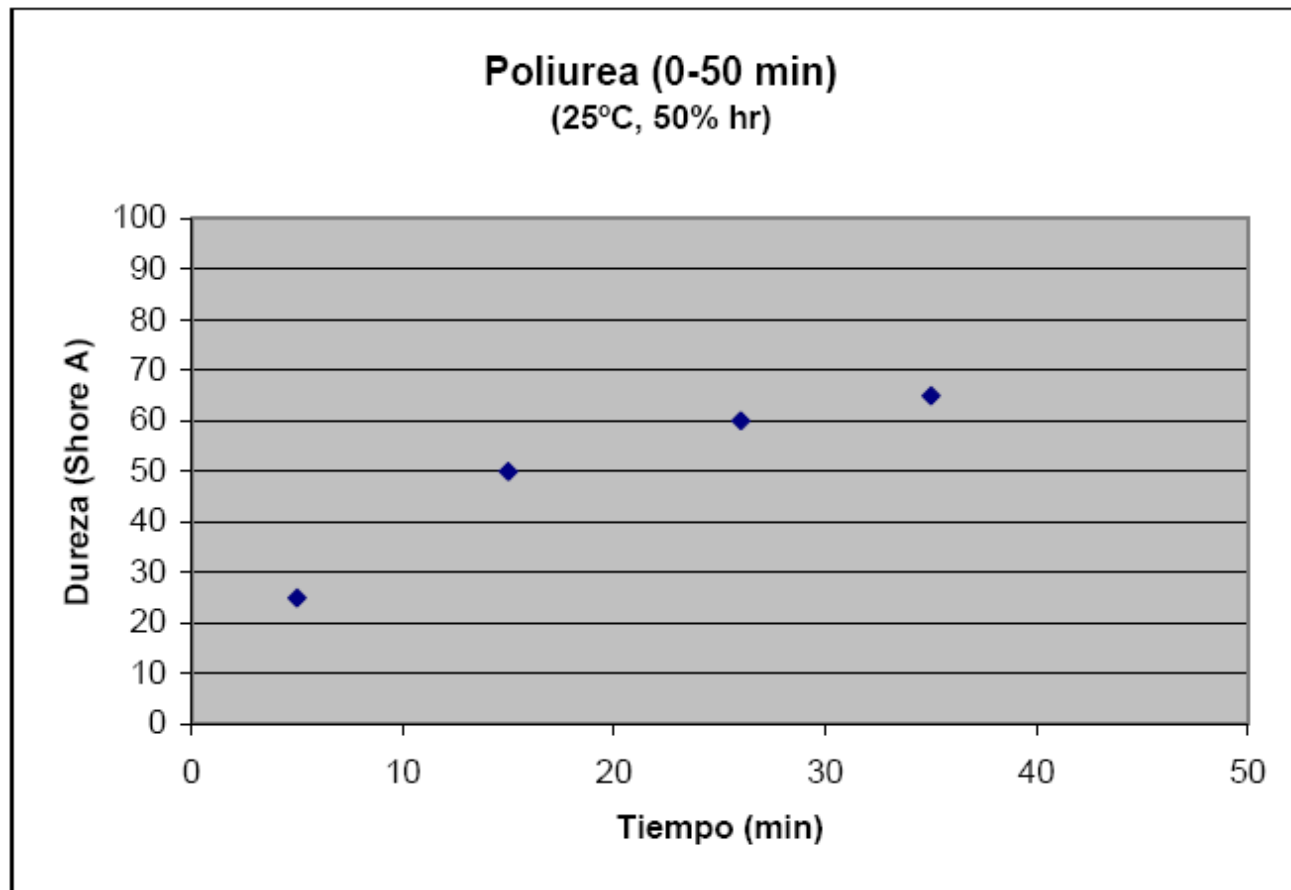
STEP 4: SPRAYING.

- DO NOT SPRAY UNTIL YOU ARE CONFIDENT THAT PRODUCT COMES WELL THROUGH THE MACHINE (i.e. YOU GET THE RIGHT HARDNESS).
- DEMAND HARDNESS CURVE FROM SUPPLIER.
- POLYUREA MAY LEAVE PORES ON UN-SEALED SUBSTRATES. IT IS EXTREMELY IMPORTANT NOT TO LEAVE ANY PORES.
- APPLY POLYUREA IN SEVERAL COATINGS / PASSES. THIS HELPS TO SEE / DETECT PORES WHICH COULD HAVE CATASTROPHIC CONSEQUENCES.
- WEAR APPROPRIATE RESPIRATORY / SKIN PROTECTION.



STEP 4: SPRAYING.

HARDNESS EVOLUTION FOR RAYSTON POLYUREA:



STEP 5: FINISH.

- IN OUTDOORS WATER TANKS, AROMATIC POLYUREAS WILL YELLOW.
- IF COLOUR STABILITY IS DEMANDED, WE SHALL USE ALIPHATIC POLYUREAS OR UV STABLE TOP COATS APPROVED FOR CONTACT WITH DRINKING WATER.
- IT IS ADVISED TO RINSE WATER TANKS ALWAYS BEFORE FILLING THEM UP WITH DRINKING WATER.



CONCLUSIONS:

-POLYUREA IS A GREAT ALTERNATIVE FOR THE REFURBISHMENT OF WATER TANKS.

-PRODUCT MUST HAVE APPROVAL BY INDEPENDENT LAB FOR E.E.C. DIRECTIVE 98/83/CE (DRINKING WATER FOR HUMAN CONSUMPTION), AND SUBJECT TO LOCAL REGULATIONS FOR EACH COUNTRY.

-JOB EXECUTION MUST BE DONE BY PROFESSIONAL COMPANY, AND AGREED WITH MATERIAL SUPPLIER TO ENSURE SUCCESSFUL APPLICATION.