

POLYUREA SPRAY COATING SYSTEM **/Application in KOREA /**

KYUNGMYUNG.MOON. KANGNAM CHEMICAL CO.,LTD.R&D CENTER



1ST, DECEMBER, 2000

Abstract

There are many problems, corrosion & leakage, in concrete construction in Korea It's because

- Neglected the importance of waterproofing
- Did not use the proper waterproofing materials
- Neglected the maintenance

The market of construction is changed

- Personal expenses of worker is raised
- Decrease of workers

The Needs of customers are changed

- Perceive the importance of waterproofing and anticorrosion
- High quality materials
- Precision construction

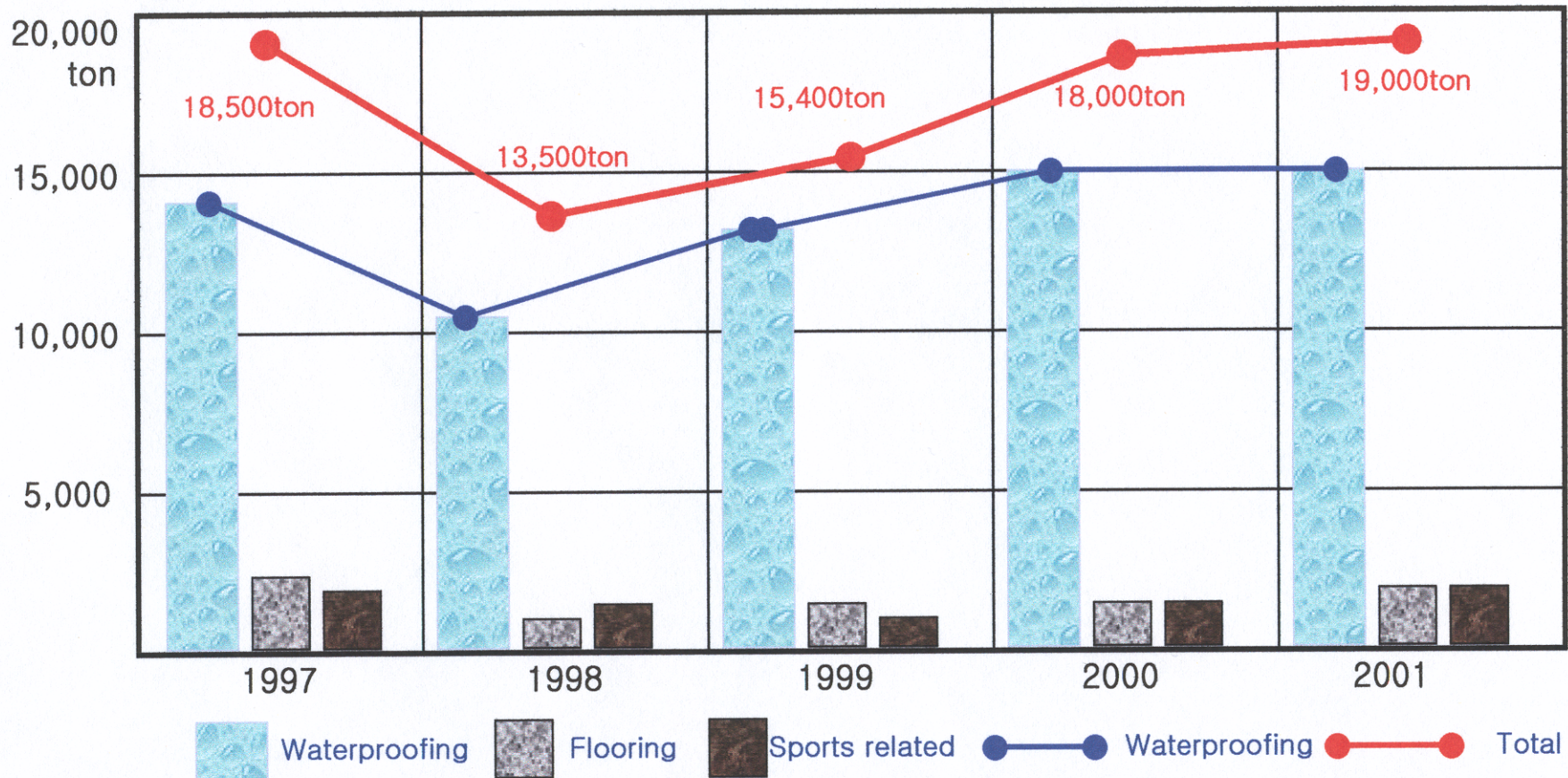
Development of Polyurea spray coating system

- Makes it possible of the needs of customers



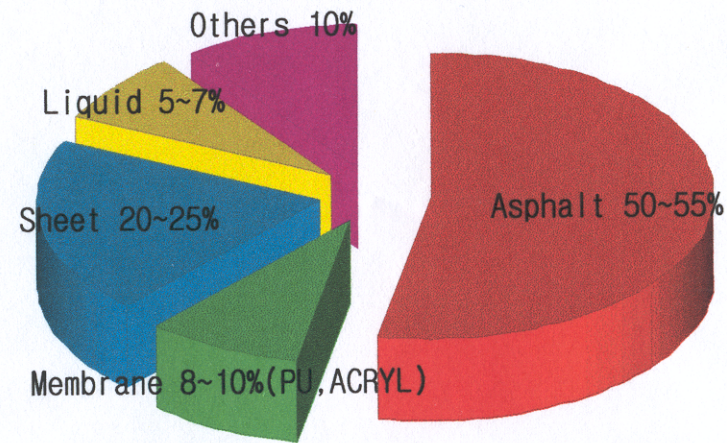
Abstract

Construction related Polyurethane Market in Korea



Abstract

Waterproofing materials used in Korea

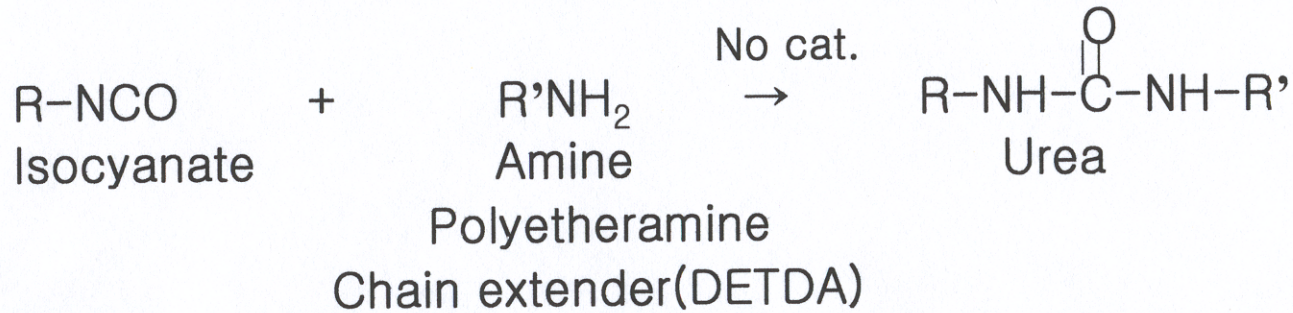


Area ratio. Total area is about 70km²

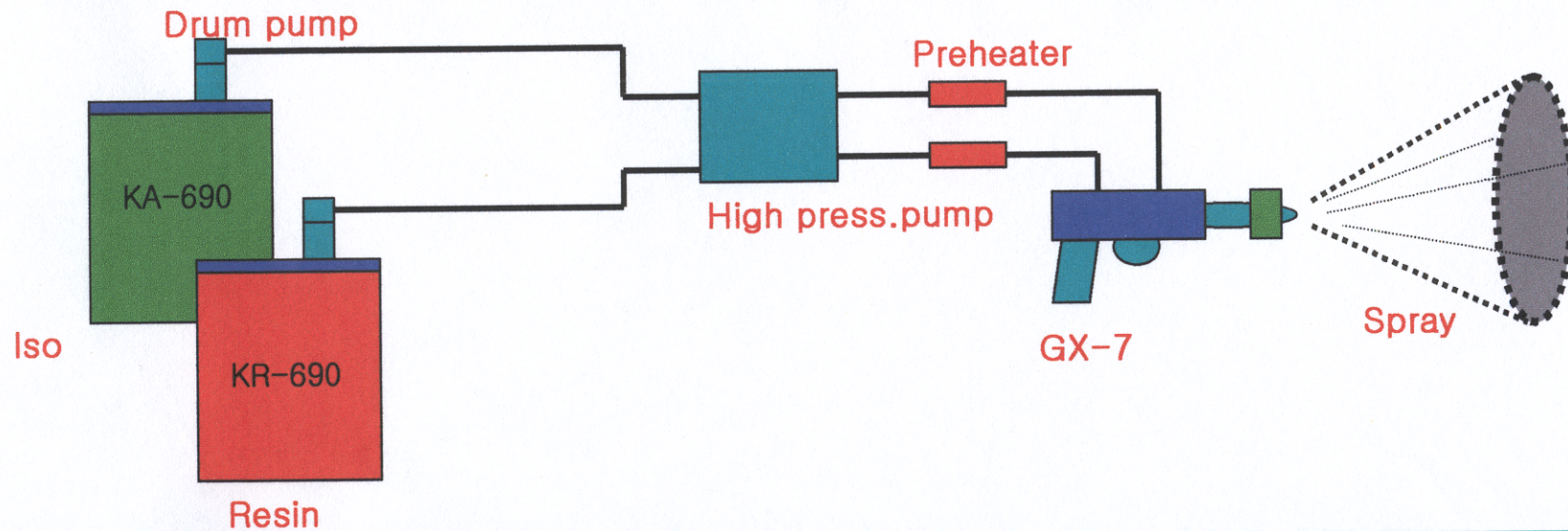


Introduction

Chemical mechanism



Applying Diagram



Introduction

Advantage of polyurea spray coating

- + Fast reactivity : Reduce a term of works
- + Solvent free
- + Catalyst free
- + Good physical and chemical properties
- + Apply by machine

Properties

	Isocyanate prepolymer STELACOAT KA-690	Amine mixture STELACOAT KR-690
Ingredients	MDI Polyol	DETDA, UNILINK Polyether amine(Jeffamine), Pigment
Viscosity(cps.25)	500~1500	300~800
Sp.gr.	1.07~1.17	0.97~1.07
Gel time (sec)	2~5	
Tensile strength (kgf/cm ²)	200~280	
Elongation (%)	300~400	
Hardness (Shore A)	95~98	
Tear strength (kgf/cm)	80~110	
Abrasion resistance (H-22)	150~200	



Introduction

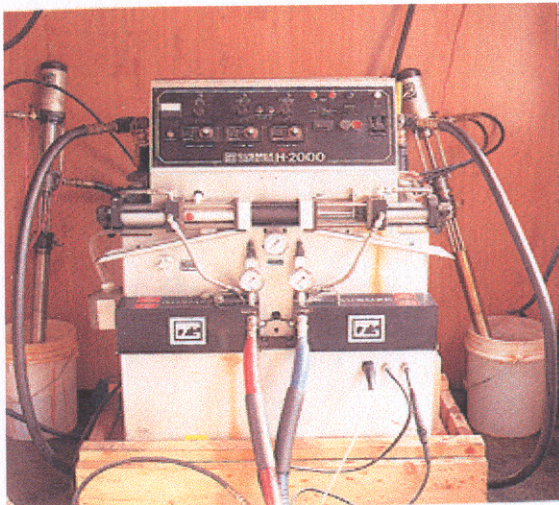
Basic uses

- Waterproofing
Exposure
Non Exposure
- Flooring
Factory, Car park, Ware house
- Coating
Pipe, Sewage disposal plant
- Others
Open mold, Artificial wall

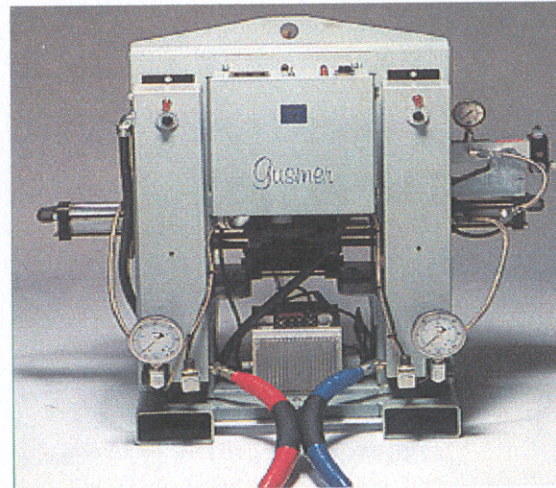


Introduction

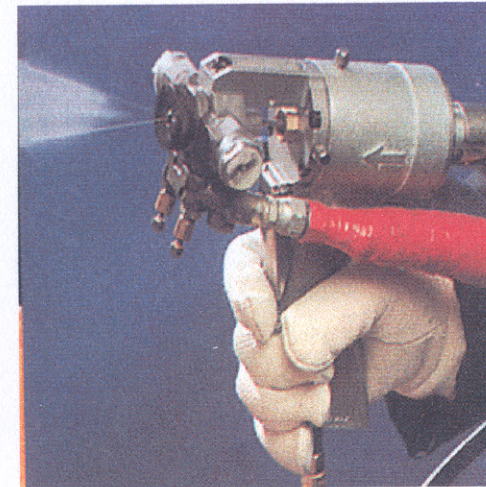
Spray Equipment



GUSMER H-2000
(Bought in 1993
Repair to H-3500 in 1999)



MARKSMAN



GX-7 GUN



Application

Incheon International Airport(IIA)

Out line

- Being developed on 5610 hectares by connecting existing two islands Yongjong and Yongyu, using a 17.3km dike.
- Will have 4 Runways and 2 Passenger terminals.
- In it's final phase in 2020 IIA will handle 100million passengers, 530,000 flights and 7 millions of cargo annually.

Facility scale

Classification		First phase	Final phase
Airport	Air field area (ha)	1174	4744
	Runway (m)	3750*60 (two)	3750~4200*60(four)
	Passenger terminal (1000m ²)	491	1120
	Cargo terminal (1000m ²)	175	805
	NAVAIDs	CAT-III a	CAT-III b
Transportation	Express way	40.2km,6-8lanes	40.2km,6-8lanes
	Railway		57.3km(double track)
Community (ha)		218	873



Application

Necessity of Polyurea coating

- ✚ Waterproofing to protect from sea water
Have good resistance to salt water
- ✚ Basement wall
Excellent workability
Necessity of resistance against groundwater
- ✚ Waterproofing running parallel with ground
High speed curable for reducing curing time



Application

Transportation center

■ Construction company : Samsung construction

History

1998

● The occurrence of the point at issue to existing waterproofing method : Bentonite waterproofing

1999. 2

● Examination of Polyurea spray coating system

1999. 7

● Mock-up test

Polyurea spray supplier : 4

Job site : Out wall of Transportation center (below the ground)



Application

1999. 8

- Finally 2 Polyurea spray maker and 3 Installer was approved

Product supplier	Applicator
Kangnam chemical co.,ltd. Kukdo chemical co.,ltd.	Kangnam chemical co.,ltd., Yaksu Hanbo

2000. 6

- Finished the Transportation center
- Total application area : 23,200m²
(divide two sector to Kangnam & Kukdo)



POLYUREA COATING SYSTEM

Application

Application method

Surface preparation

- ✿ Grinding
- ✿ Priming (1K polyurethane PLYADEK T-117)
- ✿ Treat the Form-tie and Pin-hole (1K polyurethane T-117 & Silica)
- ✿ Sealing crack & Expansion joint
(2K polyurethane sealant, K-SEAL KC-300A/KC-330B)

Priming

- ✿ 1K polyurethane PLYADEK T-117

Applying

- ✿ STELACOAT KA-690/KR-690
- ✿ GUSMER H-3500, MARKSMAN, GX-7 Gun

Check

- ✿ Coating thickness (min 1.5mm.)
- ✿ Adhesion strength (min 15.3kgf/cm²)
- ✿ Tensile strength (min 150kgf/cm²)
- ✿ Other properties

Filling

Finish



POLYUREA COATING SYSTEM

Application

Application Picture



Transportation center

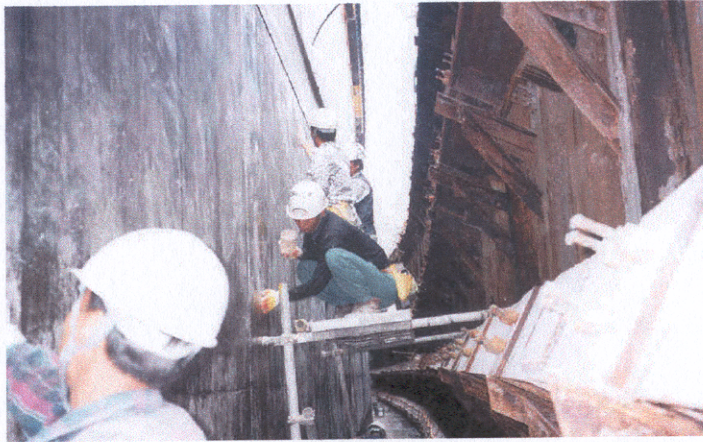


Surface preparation



POLYUREA COATING SYSTEM

Application



Fill Form-tie and Pinhole

(2K Polyurethane sealant

K-SEAL KC-300A/KC-330B)



Priming

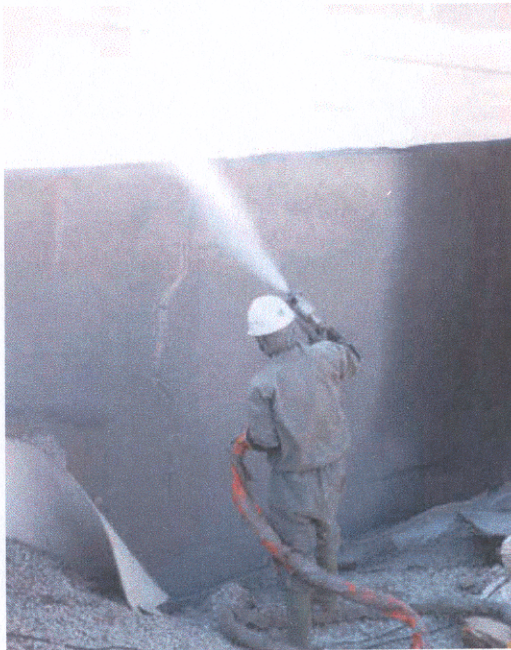
(1K Polyurethane Primer

PLYADEK T-117)



POLYUREA COATING SYSTEM

Application



Spray coating

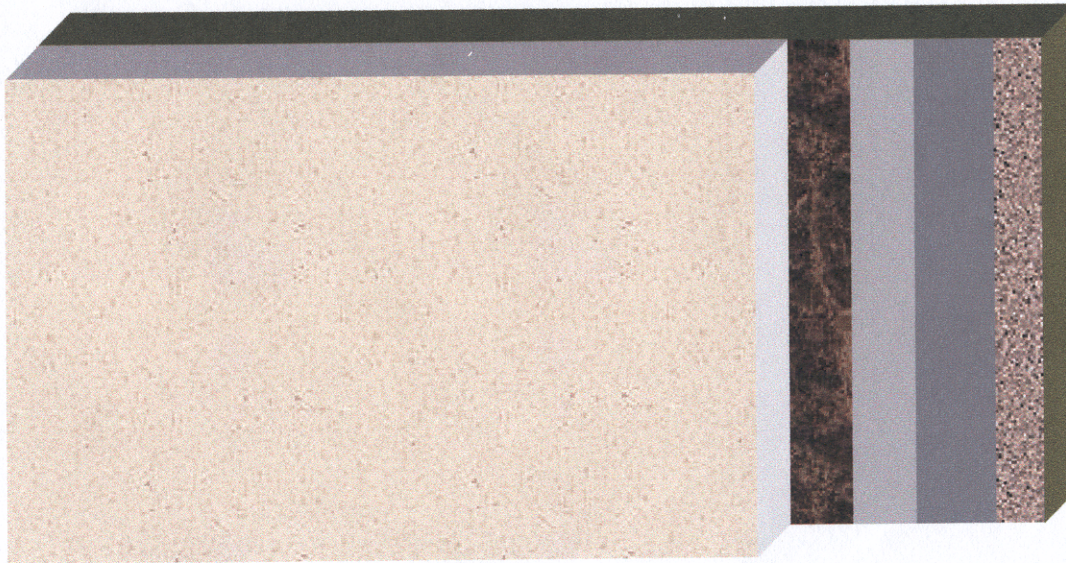


Finish

POLYUREA COATING SYSTEM

Application

Application details



Concrete : Form-tie Crack,Joint

Treat Joint, Form-tie with PU sealant

1st Priming (1K PU Primer T-117)

2nd Priming (1K PU Primer T-117,silica)

3rd Priming(1K PU PrimerT-117,Cement)

Polyurea (STELACOAT KA-690/KR-690)

Application

Standard properties & Test result

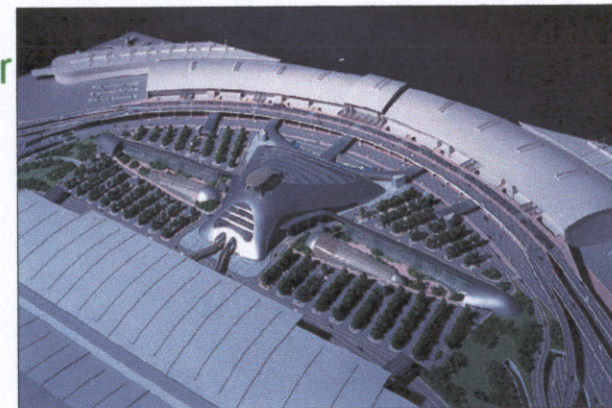
	Standard	Result	Method
Tensile strength(kgf/cm ²)	150 above	210	KSF-3211
Elongation (%)	200 above	350	KSF-4920
Tensile product (kgf/cm)	800 above	1500	
Tear strength (kgf/cm)	50 above	90	
Adhesion strength (kgf/cm ²)	15.3 above	30	KSF-4723
Salt water resistance (300hrs)	R.N-10	R.N-10	KSF-9502
Other chemical resistance	NO Defects	NO Defects	JISK-5400
Elution test	NO Defects	NO Defects	



Application



- Main application area
- Transportation center
 - Subway
 - Overbridge



Transportation center



Application

Application list of Polyurea spray coating in Incheon International Airport

Location	Construction company	Applying Area(m ²)	Applied by Kangnam (m ²)
Transportation center	Samsung	23,200	11,700
Exterior wall of Subway	Ssangyong	107,548	47,000
Over bridge and Surrounding constructure	Hanjin	60,000	60,000
Exterior wall of water reservoir	Kumho	7,700	7,700
Exterior wall of general wire line	Kumho	6,500	6,500
Exterior wall of rail way	Kumho	9,700	9,700



Application

The other application

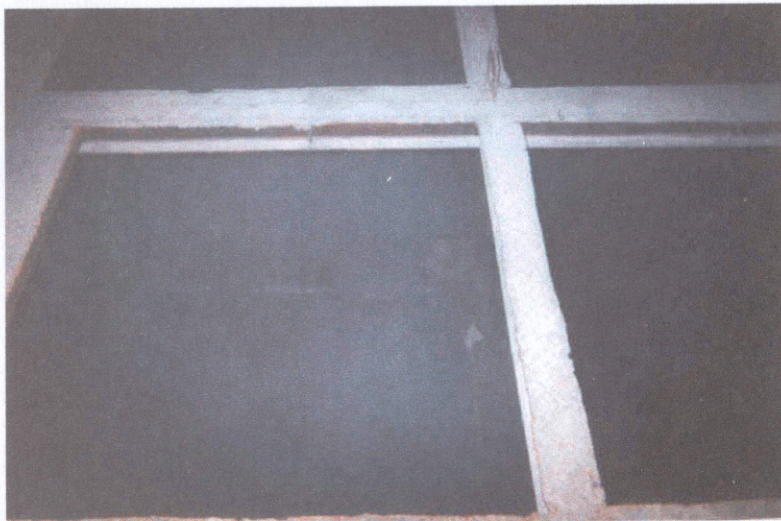
A sewage disposal plant

- + Applied plant : Kwangyang Iron&steel co.,ltd : 200m²
Kwangju Songdae sewage disposal plant : 3800m²
(plan to apply in december,2000)
- + Necessity of Polyurea spray coating system
 - Good chemical resistance
 - Good thermal stability
 - Good mechanical properties
 - High reactivity
- + System : Polyurea STELACOAT KA-690/KR-690,3mm
- + Term of application : october, 2000
- + Applied method
Surface grinding → Treat the surface pinhole →
→ Priming (1K polyurethane T-117) → Polyurea spray coating

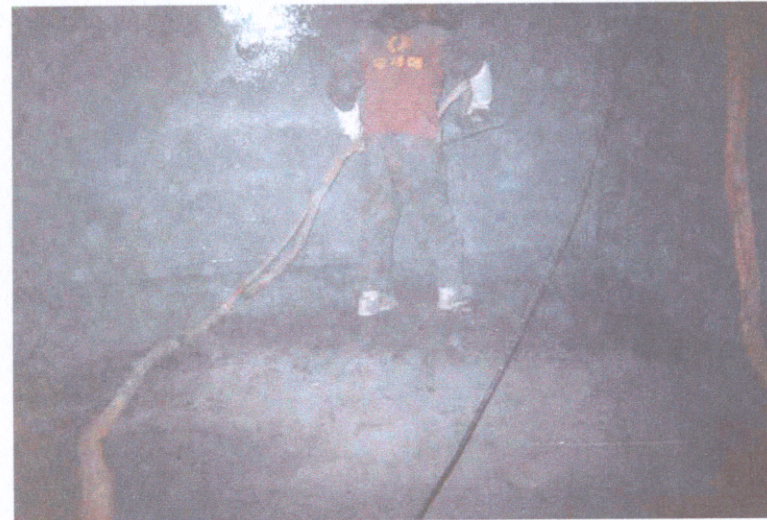


POLYUREA COATING SYSTEM

Application



Kwangyang Iron&steel co.,ltd.
sewage disposal plant



Polyurea spray coating



Application

Open mold

- + Applied plant : KBS(Korean Broadcasting System) Drama
"King WangGon" setting mold
- + Necessity of Polyurea spray coating system
 - High speed workability
 - No irritating order
 - Elasticity
 - Hardness

	Existing method	Problems	Changed method
Mold	FRP : Hand lay-up	<ul style="list-style-type: none"> ● Order : SM ● Glass fiber ● Crack 	Polyurea (STELACOAT KA-690/KR-690)
Molding Article	Polyamide resin (Hot melt adhesive)	<ul style="list-style-type: none"> ● Thermal stability ● Workability 	Polyurethane- urea hybrid PU foam



Application

Application method



Mold making



Molding article

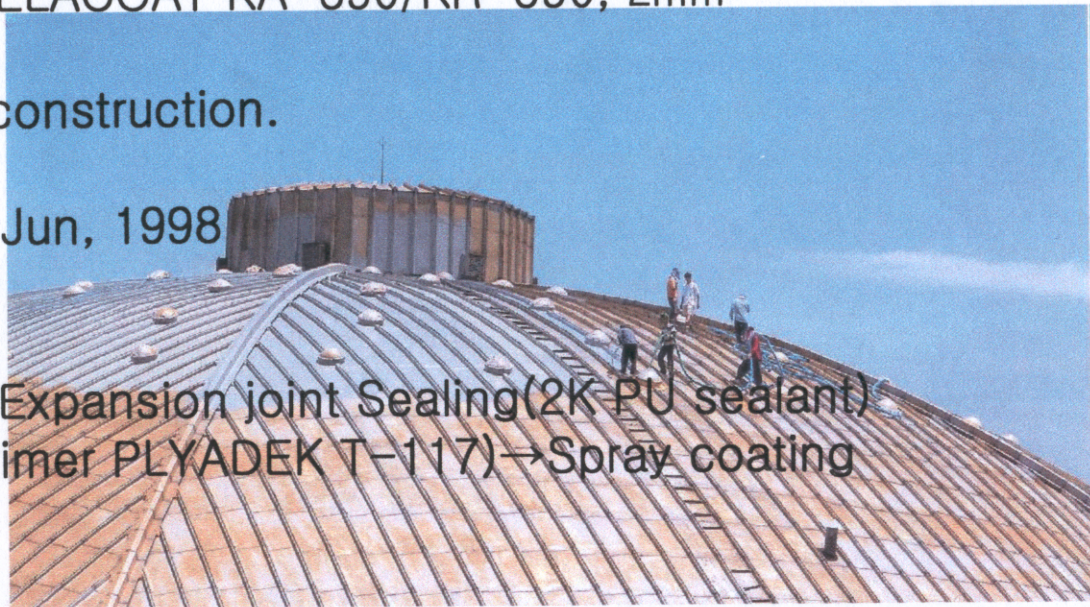
Drama “King WangGon” : King WangGon established Koryo dynasty in 918A.D. KBS made this history as drama



Application

Waterproofing on Dome-shaped construction

- Applied plant : Daejeon Chungmu gymnasium
- Necessity of Polyurea spray coating system
 - High speed workability : contineous membrane, No flow
 - Excellent mechanical property
 - Workable by machine
- System : Polyurea STELACOAT KA-690/KR-690, 2mm
- Applicator : Sunwoo construction.
- Term of application : Jun, 1998
- Application method
 - Surface grinding → Expansion joint Sealing(2K PU sealant)
 - Priming(1K PU Primer PLYADEK T-117) → Spray coating



Application

Waterproofing on the bridge of Rapid Railway

- ✱ Applied plant : Rapid Railway Cheonan section
- ✱ Necessity of polyurea coating system
 - Good physical properties
 - High temperature stability : not be affected by Ascon over coating
 - High speed workability
 - Low temperature workability : workability by sub-zero temperature
 - Working by machine
- ✱ System : Polyurea NS-28. 2.5mm
- ✱ Term of application : December, 1998
- ✱ Application method
 - Surface grinding→ Expansion joint sealing(2K PU sealant)
 - Priming(1K PU Primer PLYADEK T-117)→Spray coating



POLYUREA COATING SYSTEM

Application



Polyurea spray coating on the bridge of Rapid Railway
(Applied plant : Rapid Railway Cheonan section)



KANGNAM CHEMICAL CO.,LTD. R&D CENTER



Prospect

The future prospect of Polyurea spray coating system in Korea

- After be adopted the Polyurea spray system in Incheon International Airport the concern&confidence of this system is elevated in Korea.
- Technology in making and applying this system is accumulated.
- It is expected that this system will be more adopted as waterproofing material in Subway exterior wall and other concrete construction.
- Waterproofing on special part such as Dome shape construction, chemical tank and concrete construction where needed a chemical resistance will be increased.

