individually conducted by 5 institutes namely:

- Thailand Institute of Scientific and Technological Research
- King Mongkut's Institute of Technology, Thonburi
- Department of Mineral Resources
- Chulalongkorn University
- Chiang Mai University

Only some activities of technology transfer are summarized as follows:

4.1 Training in Japan

A training programme for local counterparts to be undertaken in Japan is proposed as follows:

(1) Year 1993

- Instrumental analysis (1)
- Corrosion protection of polymer films (1)
- Corrosion protection of organic coatings (2)
- Electrochemistry (1)

(2) Year 1994 to be discussed

4.2 Expert

Experts (both short term and long term) in various fields of corrosion are requested upon the necessity of the activities.

4.3 Collaborative research

The collaborative research in Japan should be arranged if no facilities in Thailand are made available

4.4 Conference/Seminar

Seminar should be organized at least once a year throughout the project.

4.5 Visit

Visit to corrosion research centers and industrial plants in Japan for senior staff should be managed in order to observe new developments in R&D corrosion activities.

5. PROJECT DURATION

The duration of the project will be 2 years, commencing on 30 November 1992.

6. EXPECTED OUTPUT/BENEFIT

The expertise developed and experience gained from this study will contribute the improved technologies in corrosion protection of organic coatings which are widely acceptable and well recognized in various industries such as construction and transportation. This study will also produce data and technical information which will be beneficial to industries since it will minimize economic loss and there is no such comprehensive information available for the time being in this country.

7. EXPECTED DONOR COUNTRY

Japan

Plan for follow up programme of TISTR (Focal Point)
Atmospheric Corrosion-Organic Coatings
From 30th November 1992 to 29th November 1994

1. To complete all equipment installation, operation and training for instrumental analysis.

Year 1993 requested.

1.1 1 fellowships to train TISTR's Thai personnel in Japan on Electrochemistry at NRIM.
Justification : TISTR's personel required more experience to interprete the results.

1.2 Some spare parts and other necessary equipments which may be suggested by experts.
Justification : Some equipments required special spare part at least 5 year service. Attachement of some equipment to assist the continuetion of work more efficiently.

1.3 Experts : Electrochemical Technique to evaluate the paint film performance
Justification : to correspond to 1.1

2. To complete all data collection and evaluation which is scheduled for 5 years. (The delay was due to starting date of exposure in 14th June 1989 which had been delaved for almost 2 years).

2.1 Year 1993
- Atmospheric pollutant and Meteological data;
- The corrosion rate of
  Carbon steel, bare metal after 5th, 6th one-year exposure

Topic will be discuss with joint meeting between working group and of the project Japanese evaluation.

- Carbon steel, bare metal after 2nd two-year exposure
- Carbon steel, bare metal, metallic coated steel after four year exposure
- Painted steel after three year exposure.
- FRP after three year exposure.

2.2 Year 1994

- Atmospheric pollutant and Meteological data.
- The corrosion rate of
  - Metallic coated steel after 2nd two-year exposure.
  - Painted steel after five-year exposure.
  - FRP after five-year exposure.

3. To be able to contribute to the development of corrosion prevention technology to the industries, material user of all concerned in Thailand.

Year 1993 requested to support joint conference as preconference with the 8th Asian pacific corrosion control conference, Bangkok, 6-11 December 1993.

Year 1994 requested to support final seminar on "Atmospheric Corrosion-Organic Coatings" after project complete.

Accelerated Testing of Shop Primers and polymer films for Corrosion protection

Background

In the present phase of the ASEAN-Japan Cooperation on Science and Technology, the Sub-Project on Atmospheric Corrosion-Organic Coating carried out by Thailand at KMITT involved testing of shop primers by combination of a sun follow weather meter and a combined cycle corrosion test.

Owing to the delay in acquisition of the equipment KMITT only received the two equipment in December 1991 and completed installation in June 1992. The remaining of FY 1992 will be used for actual testing of shop primers, originally planned for at least 2 years.

In late 1991, KMITT started another corrosion project, funded by the Thai budget, on accelerated testing of polymer films for corrosion protection. It was designed to compliment the ASEAN-Japan Project employing shop primers as polymer film coatings have great applications an corrosion protection as well as shop primers.

To enable KMITT to fulfil its original plan of testing of shop primers for at least 2 years under supervision from Japanese expersts and to conduct a complimentary activity on polymer film coatings, it is proposed to extend the Sub-Project for 2 years.

Objectives

1. To study mechanism and kinetics of shop primer and polymer film degradation under accelerated testing.
2. To study mechanism and kinetics of metal corrosion after corrosion protection films are degraded.

Scope of the project

1. Preparation of shop primer coated specimens.
2. Preparation of specimens coated with polypropylene film, ethyl-vinyl-acetate film, polytetrafluoroethylene film etc, of various thickness by electrostatic coating technics.
3. Accelerated testing using salt spray tester, CASS, sun follow wether meter, and dipping in strong acid, strong base and salt solution.
4. Determination of mechanism and kinetic constant in shop primer and polymer films degradation.

Methodology

1. Preparation of shop primer coatings and polymer films by electrostatic coating technics and characterise the film properties.
2. Testing of specimens using salt spray, CASS, sun follow wether meter and dipping in chemical solution
3. Determination of mechanisms of coatings and films degradation.
4. To compare the corrosion protection of coatings and films.

Work Schedule

1. Training on scientists/engineers for corrosion protection technology at KMITT.
2. Expert visits to KMITT for transfer of technology in the areas of
   - Salt spray and CASS (1 month)
   - FRA (2 months)
   - Electrochemical techniques relating to corrosion (3 months)

Work Schedule

	Year I				Year II			
	1-3	4-6	7-9	10-12	1-3	4-6	7-9	10-12
Expert services	x		x		x			x
Sample preparation	x							
Training	x	x						
Salt spray testing		x	x	x				
Cass testing				x	x	x		
UV-Weatherometer testing					x	x	x	
Sun-follow testing			x	x	x	x	x	
Chemical testing		x	x	x				
Analysis				x	x	x	x	x
Workshops and information dissemination							x	x

Thai Inputs

1. Available man power at KMITT

   Material scientists/engineers 2

   Chemical engineers 2

   Electrical engineers 1

2. Equipped laboratory and workshop

3. Expenses in conducting workshops and dissemination of information to Thai industry.

Budget (¥)

		(¥)	Total
I).	Experts (6 man-months)	-	to be costed
II).	Equipments		52,000,000
	a. DSC/DTA	-	
	b. FTIR available at KMITT	-	
	c. SEM/Stereomicroscope	-	
	d. Potentiostat		
	e. FRA (Frequency Response Analyzer)	8,000,000	
	f. Gross meter	2,000,000	
	g. Colormeter	2,000,000	
	h. GPC. (Gel permiable chromatography) for high temperature	40,000,000	
III).	Materials		
	a. Chemicals and other consummables	2,000,000	2,000,000
			54,000,000 and 6 m-m of expert services

Implementing Agency

King Mongkut's Institute of Technology, Thonburi

Comparative Study of Corrosion Performance of Coated Steels for Automobile by Electrochemical Method

1. Background

For a systematic development of new and more effective coating materials for cars, it is most important to have results of corrosion performance corresponding to experience in a short time. Rapid laboratory tests are indispensable, because the formulator in a paint factory can not wait for several years to get the results of natural weathering, and to recognize the influence of variations of paint formulations upon corrosion performance.

Electrochemical corrosion tests have been attractive to many investigators because they operate on the mechanism of the corrosion process. For example, they can be used to increase or control the oxidising potential of an environment and thereby reveal specific characteristic of a material such as passivity. Similarly, electrochemical technique can be used to measure corrosion rate without removing the specimen from the environment or even significantly disturbing it.

2. Objectives

1. To study the basic information on the mechanism of different primers and paint systems under accelerated test.

2. To study the effect of water absorption on the corrosion resistance of painted steel panel.

3. Scope of the project

1. Preparation of primers and coated specimens.

2. Three surface treatments were used.

- iron phosphate coating, with chromic acid rinse treatment,
- zinc phosphate coating, with water rinse treatment,
- degreased steel panel.

3. Testing of specimens using electrochemical technique.

4. To compare the corrosion resistance of coating systems.

4. Project Site : Department of Mineral Resources.

5. Project Duration

The duration of the project will be 2 years, commencing to 30 November 1992.

6. Project Requirement

1. Training in Japan:

1 fellowship for electrochemistry.

2. Expert:

1 short-term expert (3 months)

3. Equipments:

Gross meter

- Colormeter

- Coating thickness tester

Plan for follow up programme of C.U.

Atmospheric Corrosion-Organic coating From 30th November 1992 to 29th November 1994.

1. Supporting data collection and evaluation, which is scheduled for 5 years, by using our post graduate students who will work on thesis corcerning atmospheric corrosion.

2. C.U. also has a plan to conduct research on development of organic coating for corrosion protection. Therefore, exchanges of technical personnel and experts are requested.

Corrosion Test of Organic Coated Materials by Exposure in Thailand

การทดสอบการกัดกร่อนของวัสดุเคลือบผิวด้วยสารอินทรีย์ที่ทดลองในประเทศไทย

1. Project Site : Chiang Mai University.

2. Request for Technical Assistance from Japan International Cooperation Agency (JICA) under the Asian-Japan Project on Atmospheric Corrosion-Organic Coatings.

3. Coordinater

Associate Professor Dr. Bundit Na Lamphun. Head Department of Physics, Faculty of Science, Chiang Mai University, Chiangmai 50002. Tel.(053) 221-699 x 3367. Fax(6653)222-268, 217143.

4. Head of the Project

Assistant Professor Dr. Somchai Thongtem.

B.Sc.(Physic), Chulalongkorn University.

M.Sc.(X-Ray Crystallography), Chiang Mai University.

M.S.(Metallurgical Engineering - Corrosion), University of Illinois at Chicago, U.S.A.

Ph.D.(Metallurgical Engineering - Corrosion), University of Illinois at Chicago, U.S.A.

Visiting Scholar, The University of Leeds, United Kingdom.

5. Co-workers

1. Assistant Professor Titipun Kwangsuksathid.

B.Sc.(Chemistry), Chiang Mai University.

M.Sc.(Inorganic Chemistry), Chiang Mai University.

Dip. in Electroceramics, Tokyo Institute of Technology, Tokyo, Japan.

2. Dr. Sermkiat Jomjunyong.

Bachelor of Engineering(Electrical Engineering), Chulalongkorn University.

M.Eng. (Industrial Engineering) LAMAR University, Texas , U.S.A.

D.Eng. (Manufacturing Engineering), Musashi Institute of Technology, Tokyo, Japan.

3. Mr. Nungkorn Haraluck.

B.Sc.(Geology), Chiang Mai University.

M.Sc.(Geology), V.U.B. Belgium.

Visiting Scholar, The University of Leeds, United Kingdom.

6. Purpose

1. To test the adhesion of the organic materials with the metals after being immersed in NaCl solution.
2. To determine the change of color of the organic materials after being immersed in NaCl solution and distrilled water.
3. To find the diffusivity of Cl through the organic materials.

7. Experimental Work

Selected bare metals coated with organic materials are left in 0 - 5 % NaCl solution and distrilled water. The experiment is then tested the adhesion and determined the change of color of the materials. It is also needed to determine the diffusivity of Cl^- through the film made with organic materials at differnt thickness and composition.

8. Equipment Required for Phase I

1.	Salt spray test instrument	2,500,000.- Yen.
2.	Dry painting booth	1,500,000.- Yen.
3.	Air compressor and painting equipment	1,500,000.- Yen.
4.	KETT Coating thickness tester	200,000.- Yen.
5.	Wet thickness tester	10,000.- Yen.
6.	Wet type pinhole tester	100,000.- Yen.
7.	Handy colour tester	800,000.- Yen.

8.	Handy gloss meter	500,000.- Yen.
9.	Adhesion tester	200,000.- Yen.
10.	Cross cut guide	100,000.- Yen.
11.	Bar coater	200,000.- Yen.
12.	Electronic balance	150,000.- Yen.
13.	Portable Horiba Conducting Meter	150,000.- Yen.
14.	Permascope thickness meter	200,000.- Yen.
15.	Wet and Dry Hygrometer (moisture meter)	15,000.- Yen.
	Total	8,125,000.- Yen.

Remark. Nos. 1 - 13 will be donated by JICA soon.

9. Materials

1. Carbon Steel (ISO)
2. Aluminium
3. Copper
4. Cold Rolled Steel
5. Stainless Steel, SUS 304, SUS 430, SUS 316
6. Galvanized Steel, Hot dip and Electroplating
7. Tin Free Steel (TFS)
8. Lead
9. Tin Plate
10. Zinc
11. Alkyd
12. Vinyl
13. Epoxy

10. Phase II Follow phase I.

11. Equipment for Phase II request from JICA

1. Scanning Electron Microscope Equiped with Energy Dispersive X-ray Analyser, 10 million baht: This powerful equipment is able to determine micro-structures and chemical compositions at a specific point on the corroded samples. It can also used for determining the thickness, size and shape of the corroded samples, the corrosive products and the second phases embeded in the matrix. All the data can be plotted by using a printer or be taken as micrographs.

2. Image Analyser Set, 4 million baht: The equipment is used for measuring thickness of organic coatings in order to determine the corrosion rate. It can use to determine the porosity, area and shape of blisters and corroded surfaces of the samples.

3. Monitors, 2 million baht : for measuring SO_x, CO_x, Cl_2, NO_x and water vapor.

4. Mounting Machine, 700,000.- baht: The machine is used for mounting small samples on mounting materials. The samples are thus able to handle easily and are ready for analysis.

5. Materials, 400,000.- baht : (samples coated with organic materials and uncoated substrates both Japanese made and local made obtained from JICA).

6. Other expenses, 200,000.- baht : like evalution meeting.

Total 17.3 million baht

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