<特別報告>

1. ECAFE에 보고된 한국·호주·인도·이란·일본. 싱가폴의 부식과 방식기술 현황

아래에 전재하는 기사는 작년 9월 방콕에서의 "개발에의 과학기술의 적응"을 위한 아시아 지역자문위원회에 제출된 회의자료로서 공업·주택·기술위원회의 기술담당국장 Tun Thein씨가 본지 편집이사 윤창구 박사에게 보내온 것이다.

이웃 나라들의 부식·방식관계 활동을 상세히 알 수 있는 기회이므로 소개 드리는 바이다.

ECONOMIC COMMISSION FOR ASIA AND THE FAR EAST
COMMITTEE ON INDUSTRY, HOUSING AND TECHNOLOGY
Regional Group for Asia of the Advisory Committee
on the Application of Science and Technology to Development
Tenth Meeting
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Bangkok

METALLIC CORROSION
(Item 6 of the provisional agenda)
Note by the secretariat

CONTENTS

1. METALLIC CORROSION IN THE ECAFE REGION

A. INTRODUCTORY DISCUSSION OF THE NI-NTH REGIONAL GROUP MEETING

1. Extensive documents containing a great deal of information on deterioration of materials were prepared by the ECAFE secretariat for the ninth meeting of the Regional Group for Asia of the Advisory Committee on the Application of Science and Technology to Development (ACAST). Based on these documents there was a broad-range discussion concerning the form of deterioration of various materials, such as metals, plastics, leather, paper, rubber, stone and wood. It was also noted that there was a wide spectrum of deterioration in food and canned goods. Although all those were important in the ECAFE region, the Group considered that it would not be possible to discuss effectively the problems relating to the deterioration of all materials involved. Thus, the Group decided to confine itself to the specific aspects of metallic corrosion for a meaningful discussion.

B. SIGNIFICANCE OF METALLIC CORROSION IN THE ECAFE REGION

2. Corrosion of metals was considered particularly significant in the ECAFE region, since that area was mainly located in the tropical belt and characterized by high ambient temperature, high humidity, saline environment, long coast lines and increased biological activity due to the tropical environment. It was quite clear that metallic corrosion must occur on a significant scale under those geographical and climatic conditions, unless properly dealt with. The importance of tackling that problem arose especially in the process of development, because one expected an increasing degree of industrialization with large capital investment in machinery, ships, railway systems, etc. Considering that developing countries in general were very short of capital for investment, efforts should be made to ensure that capital investment was truly productive over an extended period, and not eroded away or destroyed by corrosion.

3. Corrosion, occurring under a variety of conditions and affecting a wide range of development activities, represented iosidious and continuous damage. The Regional Group considered that it would ultimately be more profitable for countries to invest in prevention of corrosion rather than in production. It was thought that national Governments could be convinced of the importance of tackling corrosion if they were presented with an estimate of the damage it caused each year.

4. The Group noted from the prepared documents that work on metallic corrosion was already in progress in many countries of the region and that significant study was being done in some research institutions. Corrosion was also considered as an area of science and technology where work could be carried out quite successfully in individual laboratories and research institutions. Consequently, the Group felt that an attempt should be made to identify the institutions in the various countries of the ECAFE region that had already carried out good work in that field. Furthermore, it was pointed out that the programme of those institutions should not be restricted to research and development, but must also include aspects of education and training and preparation of proper maintenance prcedures and schedules.

C. RECOMMENDATIONS OF THE REGIONAL GROUP

5. From the above dellberations the Group recommended that the ECAFE Science and Technology Unit arrange:

(a) for a study to be carried out concerning the magnitude of the loss caused by corrosion each year in the individual countries of the ECAFE region;
(b) to identify, evaluate, and select institutions in the region, which were already working in that field and were capable of handling significant aspects relating to corrosion as it was applied to the tropical area, and to find ways and means for them to be strengthened through incremental investment;
(c) for programmes of education, training, and preparation of maintenance procedures and schedules.

D. FOLLOW-UP BY ECAFE ON RECOMMENDATIONS OF REGIONAL GROUP

6. In the light of the above recommendations, the ECAFE secretariat sent letters to 26 representative technological and research institutions. The letter iterated the three recommendations and enclosed a copy of the Regional Group's final report on the deterioration of materials. The letters requested information regarding annual loss due to corrosion as well as current research activities and educational programmes relating to metallic corrosion.

7. Although most countries in the ECAFE region are aware of the significance of corrosion loss, few attempts have been made to estimate the loss. India and the Republic of Korea submitted estimates regarding annual loss.

8. India reported that an attempt had been made to estimate the loss due to metallic corrosion in 1960/61. The figures given were the costs of corrosion control excluding expenditure arising from non-attention to corrosion. According to the 1960/61 attempt, the cost of corrosion was estimated to have been Rs 1,500 million (approximately $US 200 million) in that period. It was now estimated to have reached Rs 3,500 million (approximately $US 470 million) and was expected to go up to Rs 6,000 million (approximately $US 800 million) by the end of the fifth five-year plan in March 1979.

9. The most recent survey of the magnitude of corrosion loss in the Republic of Korea was made in 1968 by the Korea Institute of Science and Technology. For the 40 places covered by the survey, the annual corrosion loss was estimated to be about $US 1 million. The Institute also reported that the total magnitude of annual corrosion loss for the Republic of Korea should be in the order of $US 100 million now, since the sample of the 1968 survey represented only a small fraction of the whole.

10. Preliminary information regarding corrosion research in the following institutes was received in response to letters sent by the secretariat.

Australia

Division of Building Research, Commonwealth Scientific and Industrial Research Organization, Highett, Victoria

India

Bhabha Atomic Research Centre, Bombay

Central Building Research Institute, Roorkee

Central Electrochemical Research Institute, Karaikudi

Defence Research Laboratory, Kanpur

Gujarat University (Chemistry Department), Ahmedabad

Indian Institute of Science (Chemistry and Metallurgy Departments), Bangalore

Indian Institute of Technology, Kharagpur

Naval Chemical and Metallurgical Laboratory,

Bombay National Metallurgical Laboratory, Jamshedpur

Production and Development Fertilizer Corporation, Sindri Research, Development and Standards Organization, Lucknow

Iran

Institute of Standards and Industrial Research of Iran, Tehran

Republic of Korea

Korea Institute of Science and Technology, Seoul

Singapore

Singapore Institute of Standards and Industrial Research

11. Vocational training and refresher courses on corrosion are being offered regularly for the technical personnel working in industry in such countries as India and Japan. At universities and colleges in general, various courses on corrosion are given as part of regular curricula for different disciplines of science and engineering. Since metallic corrosion is an interdisciplinary science of metallurgy, electrochemistry, and chemical, mechanical and electrical engineering, co-operative work and reciprocal communication are essential and need to be promoted.

12. Based on the follow-up work conducted on metallic corrosion in the ECAFE region, the ACAFE secretariat believes it is important to promote effective utilization of facilities and services available in research institutions of the area. To this end, the following action is suggested:

(a) more detailed information to be sought on the research projects on metallic corrosion which are completed or are in progress in the individual institutions as well as information on available facilities and services;

(b) the collected information to be distributed to all institutions concerned so that they may be aware of each other's activities relating to metallic corrosion;

(c) the ECAFE secretariat Division of Industry and Housing to function as a co-ordinating body for co-operation among the institutions in the region.

Ⅱ. REPORTS SUBMITTED BY COUNTRIES RESPONDING TO QUESTIONNAIRE ON METALLIC CORROSION

A. AUSTRALIA

13. The Division of Building Research of the Commonwealth Scientific and Industrial Research Organiation has reported that there has been on study which zexactly follows the recommendation of the ninth meeting of the Regional Group for Asia of ACAST. The division is embarking upon a systematic study of corrosion. In view of the interest of the Regional Group, they will consider paying more attention to corrosion in the tropical parts of their country than they might have done otherwise. There is really no evidence that corrosion of metals is more serious north of the Tropic of Cancer than it is to the south.

B. INDIA

1. Magnitude of corrosion loss

14. The Council of Scientific and Industrial Research has reported that Mr. Rajagopalan, a scientist of the Central Electrochemical Research Institute in Karaikudi, has made some attempts to evaluate the cost of corrosion in India. The cost of corrosion can be divided into two components: (a) expenditure arising from non-attention to corrosion; and (b) expenditure incurred in controlling or preventing corrosion (see Table 1).

Table 1. Cost of corrosion

Expenditure arising from paying no attention to corrosion (A)	Expenditure on measures to prevent or control corrosion (B)
1. Money paid out during shut-down of plants caused by corrosion	1. Material and application cost of paints, metallic coatings, temporary preventives, surface treatments, corrosion inhibitors, cathodic protection, anodic protection, etc.
2. Replacement cost of canned food stuffs rejected because of contamination	2. Additional cost of corrosion-resistantalloys replacing corrodible metals and alloys
3. Replacement costs of products lost by leakage due to corrosion	3. Money spent on dissemination of information
4. Replacement cost of equipment roofing, aircraft parts, etc. discarded on account of corrosion	4. Money spent on research and development
5. Expenditure arising from overdesign to allow for corrosion	

The cost of corrosion is the sum of column A and column B. Since information on column A is not generally known, column B is usually given and referred to as the cost of corrosion control.

15. Expenditure involved in column B for India was worked out as Rs 1,500 million in 1960/61. The break-up for the annual investment of Rs 1,500 million in corrosion prevention in India is shown in Table 2.

16. The Council of Scientific and Industrial Research recently formed a Corrosion Research Committee to advise on funding of university research centres in the field of corrosion. In conjunction with the National Metallurgical Laboratory, the Council has published a "Corrosion Map of India" which gives an overall picture of the comparative corrosion rates in different parts of the country.

Table 2. Cost of corrosion control in India (1960/61)[1]

Details	Cost Subtotal (million rupees)	
1. Paints, varnishes and lacquers (based on half the total estimated production)	100	
Labour cost (Ratio of labour cost of application to cost of paint =1:3	300	400
2. Zinc used for galvanizing (22.000 tons)	29	
Cost of galvanization	28	57
3. Tin for making tinplate (3,000 tons)	33	
Cost of tinning	80	113
4. Output of electroplating industry	100	100
5. Nickel and nickel alloys (700 tons)	8	
Cost of fabrication (ratio of cost of fabrication to cost of metal =0.20:1)	2	10
6. Copper and copper alloys (calculated on the price of brass) (80,000 tons)	276	
Cost of fabrication (ratio of cost of fabrication to cost of metal= 1:1)	276	508
Cost of an equivalent quantity of steel to be deducted	44	
7. Lead and lead alloys (12,000 tons)	20	
Cost of an equivalent quantity of steel to be deducted	7	
Cost of extrusion (ratio of cost of extrusion to cost of metal=1:1)	20	33
8. Stainless steel (15,000 tons) (50 percent to replace steel and 50 percent to replace aluminium)	202	
Cost of fabrication (ratio of cost of fabrication to cost of metal =0.20:1)	50	224
Cost of an equivalent quantity of aluminium and steel to be deducted	28	
9. Aluminium (9,000 tons)	44	
Cost of fabrication (ratio of cost of fabrication to cost of metal =1:1)	44	83
Cost of an equivalent quantity of steel to deducted	5	
10. Internal combustion engine corrosion	10	10
Total		1.538

[1] (Details on the method of calculation for the costs are given by K.S. Rajagoplan, in Journal of Scientific Workers Association, (Kanpur), Dec. 1959 p. 7).

2. Corrosion research activities in the National Metallurgical Laboratory (NML)

17. NML has been fully aware of the need for research and development work on corrosion of metals to mitigate the enormous losses in the country. As far back as the year on 1953, atmospheric exposure tests on various metals and metallic coatings were initiated in that laboratory. During the successive five-year plans, NML has widened the scope of its activities to various other fields of corrosion, such as chemical corrosion, electrochemical protection, sea water corrosion, stress corrosion cracking, high temperature oxidation, development of surface coatings

and corrosion-resistant alloys, and inhibitors. Based on the work carried out so far, more than 100 research papers in the field of corrosion have been published. A detailed description of corrosion research activities in NML is given in the note (IENR/ASTD (IX)/5 and Add. 1) prepared by the ECAFE secretariat for the ninth meeting of the Regional Group for Asia of ACAST.

3. Corrosion research activities of the Central Building Research Institute

18. Studies on corrosion pertaining to buildings are carried out at the institute. The corrosion behaviour of mild steel in reinforced concrete (using different types of cement) and in reinforced brick works is being studied by laboratory methods, as well as by long-term field exposure tests under different atmospheric conditions. Development of anticorrosion paints and coatings for steel structures is another activity of the Institute.

4. Corrosion education and training programmes

19. The Central Electrochemical Research Institute, Karaikudi, has been conducting a short refresher course on metallic corrosion and its prevention each year for 12 years. The course, which is conducted for a period of five weeks, comprises 60 lectures on various aspects of metallic corrosion and its prevention, 30 practical sessions where participants receive first-hand knowledge of the principles of corrosion and the methods for corrosion prevention and 30 extracurricular lectures on related subjects, such as metallurgy, strength of materials, electroplating and statistics. The economic implications of corrosion, the mechanism of corrosion, the classification of corrosion processes and the methods of corrosion prevention are highlighted in the refresher course.

20. The course is designed to provide the technical personnel, who deal with corrosion problems in industry, with up-to-date developments on the subjects. The number of participants from various organizations is given in Table 3.

Table 3. Number and origin of participants in training course on metallic corrosion and its prevention conducted by Central Electrochemical Research Institute, Karaikudi

Course No.	Year	Number of participants from						Total
		Ordinance factories	Engineering factories	Chemical industries	Miscellaneous industries	Research institutions	Educational institutions	
1.	1959	—	5	2	2	1	—	10
2.	1960	—	5	2	2	3	1	13
3.	1962	1	—	—	2	4	—	7
4.	1963	8	1	4	2	—	—	15
5.	1964	—	3	2	—	4	—	9
6.	1965	1	3	3	3	—	—	10
7.	1966	8	3	2	1	5	—	19
8.	1967	5	3	2	—	2	2	14
9.	1968	1	1	1	—	3	1	7
10.	1969	3	4	2	—	3	—	12
11.	1970	3	1	—	3	3	—	10
12.	1971	4	3	—	1	3	—	11
Total		34	32	20	16	31	4	137

21. The Corrosion Advisory Bureau of the Metals Committee has conducted three-day lecture courses on corrosion in various centres in the country. These courses have been held jointly with host institutions and lectures have been given by specialists from various parts of the country. In all, 160 people have participated in these courses. The topics of these short courses include:

(a) Corrosion fundamentals held at Digha in collaboration with NML as host institute
(b) Corrosion in the iron and steel industry held at Jamshedpur in collaboration with NML
(c) Corrosion in fertilizer and petroleum industries held at Alwaye
(d) Corrosion in water and waste water engineering held at Nagpur.

22. The Corrosion Protections Sectional Committee, Indian Standards Institution, New Delhi, has drawn up codes of practice on the following aspects of corrosion and its prevention:

1. Phosphate treatment of iron and steel for protection against corrosion
2. Corrosion protection of light-gauge steel sections used in building
3. Performance tests for protective schemes used in the protection of light-gauge steel against corrosion
4. Conducting field studies on atmospheric corrosion of metals
5. Protection of iron and steel structures from atmospheric corrosion
6. Cathodic protection of steel structures
7. Sprayed aluminium and zinc coatings on iron and steel
8. Method for evaluation of results of accelerated corrosion tests
9. Conducting studies on underground and subsoil corrosion of metals

C. IRAN

23. It has been reported by the Institute of Standards and Industrial Research of Iran, Ministry of Economic Affairs, that the Iranian Petroleum Institute held its fourth symposium on metallic corrosion in Tehran in September 1972. The topics of the main papers presented at the symposium were:

1. Passivity of metals
2. Corrosion control of MIS sour gas wells
3. Monitoring internal corrosion in sour oil and gas streams.

D. JAPAN

24. The activities on corrosion science and engineering in Japan have been promoted by the 97th Committee of the Japan Society for the Promotion of Science for more than 40 years. By the developmental resolution of the 97th Committee, the Japan Society of Corrosion Engineering (JSCE) was established in January 1974, and one of the main objectives of this new society is to facilitate and promote international collaboration for corrosion study.

25. The annual corrosion loss in Japan has not been estimated accurately, but the new society is working on this problem and has created a special committee for this purpose.

26. The Fifth International Congress on Metallic Corrosion was held in Tokyo in 1972; corrosion education was one of the main topics. The activities on (a) corrosion education and training and (b) related problems are summarized below.

1. Corrosion education at the university level

27. Courses on corrosion and its prevention are offered at universities as part of the electrochemistry or metal chemistry curricula in the discipline of industrial chemistry and in the metallurgy discipline as part of the metal chemistry, surface science and technology, metal finishing or metal working curricula. There are rather few one-year courses totally devoted to metallic corrosion for undergraduates. In other disciplines, such as mechanical, electrical and chemical engineering, corrosion is introduced as part of courses on engineering materials, equipment, etc., emphasis is given to stress corrosion cracking, corrosion fatigue, wear and abrasion and stray current corrosion.

28. An inquiry about corrosion education made in September 1971 to 55 universities and 2 colleges where corrosion education and research were assumed to be carried on, received 34 responses from 24 national, 2 public and 7 private universities and one college. These institutions expressed the importance of corrosion education and the necessity of improving the quality of courses and expanding corrosion education to other branches of engineering. The number of courses totally or partially related to corrosion and its prevention that were conducted in various departments is given in Table 4.

29. For the most part, courses related to corrosion are held for 15 weeks (one semester). The undergraduate courses in the disciplines of metallurgy and in-

Table 4. Distribution of courses related to corrosion (33 universities and one college)

Discipline	Undergraduate level(33 univs. and one college)	Graduate level (21 univs.)
Metallurgy	12	9
Industrial chemistry	18	12
Chemical engineering	5	2
Mechanical engineering	12	6
Electrical engineering	3	1
Civil engineering	2	0
Shipbuilding	2	0
Agriculture	2	0
Total	56	30

The classification of courses is given in **table 5.**

Table 5. Classification of courses

Courses dealing with corrosion and its prevention	Number of courses	
	Undergraduate	Graduate
Metal chemistry, Metal finishing, Surface science and technology, etc.		
15 weeks(a)	17	9
30 weeks(a)	7	3
Electrochemistry		
15 weeks(a)	16	10
30 weeks(a)	6	3
Engineering materials, Chemical equipment, etc.		
15-30 weeks a	10	5
Total	56	30

a) A 2-hour lecture period per week.

dustrial chemistry are usually followed by laboratory work. In some universities the same courses are offered to the students of metallurgy, electrochemistry and chemical engineering as well as to those of other disciplines.

30. Since metallic corrosion is an interdisciplinary science of metallurgy, electrochemistry, and chemical, mechanical and electrical engineering, co-operative work and mutual understanding are necessary. Metallurgists approach the problem from the standpoint of metal structure, defects and dislocations, and metal working and heat treatment conditions. Chemists and electrochemists view corrosion in terms of polarization measurements and properties of corrosives, including inhibitors, while mechanical engineers are interested in mechanical stress and fatigue and dynamic flow of corrosives.

2. Vocational training

31. The Technical Training Institute of Corrosion Control, a unique organization totally devoted to education and training of corrosion engineers, is administered by the Japan Association of Corrosion Control, Tokyo, which is authorized by the Ministry of International Trade and Industry. The education and training programme consists of correspondence courses for one year, followed by schooling for three days. Between 1958 and 1972, the Institute admitted about 1,800 high school technicians and university-level engineers from various industries. This training contributed greatly to the advancement of corrosion technology in Japan. This concept of vocational training conforms with the course arranged and conducted by D. Spector of Israel, Chairman of the Education Committee of International Congress on Metallic Corrosion. [2)]

32. Another institute concerned with corrosion education is the Institute of Vocational Training, Ministry of Labour, where a limited number of students, both from Japan and overseas (on Colombo Plan Fund scholarships), are accepted for training. Though there is no specified department of corrosion and its prevention, university-level lectures are given on thermodynamics, corrosion theory, surface science and technology and corrosion-preventive painting and are followed by practical work. The Ministry of Labour holds annual examinations to qualfy experts in a number of fields of technology and crafts which encompass electroplating, anodizing and painting, and issues official certificates.

3. Society activities

[2)] Sources: Materials Protection, 8, No. 2 1969, p. 71; Extended Abstracts, Fifth International Congress on Metallic Corrosion, Tokyo, May 1972, p. 433.

33. The annual big event for the Japanese corrosion scientists and engineers is the three-day joint symposium on corrosion and its prevention. The symposium is sponsored by the Science Council of Japan and the Japanese Committee of Metallic Corrosion (consisting of 21 member societies) which is a subsidiary of the Permanent Council of the International Congress on Metallic Corrosion. Member societies include the Committee for Preventing Corrosion of Japan of the Society for the Promotion of Science; the Society of Chemical Engineers, Japan; the Society of Metal Chemistry; the Metal-finishing Society of Japan; the Japan Institute of Light Metals; the Japan Society of Colour Materials; the Japan Petroleum Institute; the Electrochemical Society of Japan; the Study Committee on Stray Current Corrosion of the Society of Electrical Engineering of Japan; the Electroplating Society; the Japan Society of Civil Engineers; the Nishi Nippon (Western Japan) Society for Corrosion and Protection; the Chemical Society of Japan; the Japan Institute of Metals; the Architectural Institute of Japan; the Mining and Metallurgical Institute of Japan; the Society of Materials Science, Japan; the Japan Iron and Steel Institute and the Welding of Chemical Equipment Committee of the Welding Society of Japan.

34. A number of societies listed above hold courses, jointly or separately, for corrosion education and training, sponsor seminars and form corrosion committees to attack the problems of urgent need and to exchange information on corrosion accidents, damage, etc.

E. REPUBLIC OF KOREA

35. The Korea Institute of Science and Technology (KIST) has reported that the last time that they made a survey on the magnitude of corrosion loss in the Republic of Korea was 1968. For the 40 places (ships, harbours and railway facilities; chemical, textile and power plants, etc.) covered by the survey, the annual corrosion loss was estimated to be about $US 1 million. Since, even at that time, the above sample represented only a small fraction of the whole, the total figure for the country is currently estimated at $US 100million. The Corrosion Science Society of Korea is planning a similar survey for the near future.

36. The three KIST laboratories (Chemical Process Development Laboratory, Physical Metallurgy Laboratory and Pilot Testing Group) have been active in the field of corrosion. KIST corrosion research facilities include a research potentiostat, linear scanning units, DC power supplies, metallurgical microscopes and other conventional items. Following is a list of the corrosion-related projects conducted at KIST during the period 1968-1974.

1. A study of corrosion of city water pipes in Seoul and its prevention, KIST Report NG 5-19 (Dec. 1968)
2. A survey of corrosion problems in Korean industries, KIST Report SR-16 (Mar. 1969)
3. A study of corrosion prevention in the cooling water circulation system of oil refineries, KIST Report CI45-48 (Dec. 1969)
4. A study of high-temperature corrosion of diesel engine parts and its prevention. KIST Report CI18-149 (Dec. 1970)
5. A study of integral colouring treatment of Alcoa S-6063 extrusions, KIST Report CI63-94 (Feb. 1970), KIST Report CI93-193 (Mar. 1971)
6. A study of corrosion and its prevention in paper industries, (to be completed by Aug. 1974)

Since there are no tropical areas in the Republic of Korea, tropical corrosion has not been emphasized at KIST. However, many problems they have considered (ref. 1, 3, 4 and 6 in the above list) are common with those of the tropical areas. In addition to the activities at KIST, a number of universities in the Republic of Korea have corrosion research programmes.

37. There have been no previous training programmes on the prevention of corrosion in the Republic of Korea, but KIST has expressed its desire to exchange staff and trainees with other institutes in the region in the field of corrosion research, if agreeable arrangements can be made. Since the major function of KIST is to carry on contract research for industries, training would be in the form of participation in some of its projects. KIST projects on corrosion problems (see 1, 3 and 6 in the above list) often pro-

vide suggestions on maintenance procedure and corrosion prevention.

F. SINGAPORE

38. The Singapore Institute of Standards and Industrial Research reported that Singapore has done some work on metal corrosion and its prevention in industries, power stations, housing, port, etc. Education and training programmes are handled by various groups connected with the different aspects of corrosion. It is considered that metallic corrosion is too wide a subject for any particular group or agency to handle. While it is considered very difficult to assess the magnitude of the loss caused by corrosion, they know that it can be substantial if certain types of maintenance are not practised.

Ⅲ. NOTE ADDED AT THE TENTH MEETING

The Regional Group expressed dissatisfaction with the progress made in the area since it had first raised the issue. It noted that the current document and the one submitted to the ninth session, provided sufficient background material for further action. The Group maintained its previous viewpoint that corrosion caused tremendous losses that the poor developing countries of this region could ill afford. The fact should be brought to the notice of the Governments and planners concerned so that action might be taken by them. It represented an area of science and technology where work could be carried out quite successfully in individual laboratories and research institutions. It was not a subject which demanded either an onormous infrastructure beyond the scope of an individual country or a large regional effort. However, the corrosion encountered in the tropical, high temperature, high humidity, long coast line, i.e. high salinity areas of the ESCAP region was of a certain specialized nature. Work done in the region in individual countries or in co-operation would have a regional value.

The Group recommended the formation of a concrete work programme to be undertaken, employing a consultant to identify, evaluate and select appropriate institutions in the region which were already working in that field and were capable of handling significant aspects relating to metallic corrosion. The report of the consultant should be submitted to the next session of the Regional Group. Efforts should then be made to find ways and means for selected institutions to be strengthened through incremental investment so that they might tackle the problems in the field of metallic corrosion which were of interest to the region as a whole. The programme of such institutions should not be restricted to research and development, but should include aspects of education and training and preparation of proper maintenance procedures and schedules. The Group also felt that in the programme of education, the utilization of unconventional methods should be included to publicize the economic significane of metallic corrosion.