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Meeting on Cooperation in the Field of Catalysts
in the Middle East and North Africa
Istanbul, Turkey
25-28 September 1995

REPORT*

* This document has not been edited.

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I. INTRODUCTION

The meeting on cooperation in the field of catalysts in Middle East and North Africa was held in İstanbul, Turkey on 24-28 September 1995. It was organized by UNIDO in cooperation with the Government of Turkey, Marmara Research Centre of Turkish Council of Scientific and Technological Research.

The meeting aimed that various joint R&D proposals on catalysis will be presented to the meeting by the participants, details of a joint R&D project will be discussed particularly from the points of views of work place, management, methodology, financing etc. and thus a suitable background for the implementation of a joint project on catalyst production, testing and identification will be prepared.

II. ORGANIZATION OF THE MEETING

The meeting was attended by the following countries: Algeria, Bahrain, Egypt, Iran, Qatar, Turkey, Tunisia. A representative from GOIC also participated in the meeting as an observer.

(i) Opening of the Meeting

The meeting was officially opened by Dr. Cemil Oğuz, Assistant Director of Marmara Research Centre, Dr. Oğuz welcomed the delegates, conveyed his thanks to UNIDO and to the Governments and institutions who cooperated with UNIDO in organizing the previous meetings.

He also mentioned how pleased he is that countries of the region have been showing how determined they are to cooperate in a joint R&D project and finally in Bahrain they have adopted on a very important subject area like catalysts preparation, testing and identification.

Dr. Oğuz added that Marmara Research Centre will be pleased to host the R&D activities at their facilities near İstanbul and make the facility available for the project as "contribution in kind" which reduces down the total project cost considerably.

Dr. Oğuz finally welcomed the delegates again and expressed his hopes that this meeting in İstanbul will result in a break through with tangible results in this series of meetings on regional cooperation.

The representative of UNIDO, _____ gave information on UNIDO's role in R&D projects and past experience in projects on catalyst preparation and testing with examples from India, Korea, Nigeria, Argentina, Turkey, Pakistan etc. He emphasized that UNIDO is well qualified to assist the countries of the region in setting up similar laboratories and monitoring research work.

The representative of UNIDO ended the opening ceremony by conveying the best wishes for a successful meeting and expressed his appreciation and thanks to the Government of Turkey and Marmara Research Centre through Dr. Cemil Oğuz, Assistant Director of the Centre.

(ii) Election of the Bureau

The participants to the meeting elected the bureau as follow

Chairman : Dr. Ö. Tunç Savaşçı, Turkey
Vice-Chairman : Hannan Al Maskati, Bahrain
Rapporteur : Medhat Youssef Mahmoud, Egypt

(iii) Adoption of the Agenda

The meeting adopted the following Agenda:

- Opening of the meeting
- Election of the bureau (Chairman, vice-chairman, rapporteur)
- Introduction of the subject by UNIDO
- Presentation of the national papers by the delegates and discussions
- Visit to Marmara Research Centre
- Adoption of the report
- Closure of the meeting

The list of participants and the program of the meeting are attached as Annexes I and II of the report.

III. SUMMARY OF THE NATIONAL PAPERS PRESENTED AT THE MEETING

UNIDO PAPER (BACKGROUND PAPER)

Overview of chemical industry indicates clearly that developments in this sector have been due to achievement on

- Catalysis
- Energy conservation
- Process engineering techniques particularly that of process control
- Environmental pollution prevention and particularly waste minimization which could be achieved through the first three items.

without doubt, catalysis area has been the one which has had the major impact on these developments.

Catalyst production and marketing has become a multi billion dollar business. The importance of catalysis not only lies with the value of the catalyst it self, but with the improvements achieved on production units they are used and/or consumed. Fine tuning of a FCC unit, adoption of a more active and more selective catalyst to various production units may result in savings in much greater amounts and may improve the process from other aspects such as environmental, energy, production quality etc.

Among the catalysts consumed heterogenous, solid catalysts constitute the major portion of the consumption. Heterogenous catalysts consumed in industry can be divided in to two major categories as zeolites and metal based solid catalysts.

Zeolites are important catalysts for petroleum, petrochemical and chemical industries. They are also consumed in other areas such as detergent formulations. They

constitute very justifiable area of catalytic research for the countries of the region. A research project to start such activities by formulating a project on FCC and hydrocracking zeolites catalysts requires a project-team consisting of a project leader, four scientists and two technicians. The project consists of equipment, training and expert utilization components. An estimated budget for such a project for a duration of 3-4 years is \$ 2.800.000 and of which equipment component constitutes the major component with \$ 2.300.000. Therefore, for a regional joint project of this kind, it is recommended that instead of starting anew, project must be implemented in a R&D institute who already have all or majority of the equipment needed. For example Marmara Research Centre has already offered to host the project. In this case total project budget can be reduced down to as low \$ 500-600.000.

Metal based solid catalysts consists, mostly of supported catalyst. These catalysts are such that the active metal is on a support which could be γ -alumina various metal oxides, zeolites, etc. Out of these supports γ -alumina seems to be the most common.

A research project on γ -alumina supported catalysts say Nickel on γ -alumina and/or Pt-Pd on the same support requires again a project team consisting of a project leader, four scientists and two technicians. The project consists of equipment, training and expert utilization components. An estimated budget for such a project is \$ 2.750.000 out of which equipment component constitutes the major component with \$ 2.350.000. Therefore, as in a case of zeolite research project, for a regional joint project at this kind it is highly recommended that instead of starting anew, the project must be implemented in an R&D Institute where the majority of the equipments needed are already present. For example, if the project gets implemented in Marmara Research Centre of Turkey in line with their proposal total equipment component reduces down to \$ 600.000 and the total project budget to \$ 1.090.000.

Catalytic R&D has had been in considerable scale in the region because consumption figures for each country do out justify economical capacities. However, if a joint project is implemented, a production unit can be justified with a suitable capacity. Therefore, the project can be considered in two major phases. The first phase is involved with the relevant R&D to develop the technology needed and the second phase which has to be considered later for the related production unit. Even only to learn about catalysts, their production, testing, identification and reaction screening methods will be of great value for the region through the scientists who will get trained and accumulate experience in the subject to be apply to the presently operating catalytic units.

ALGERIA

In Algeria the regular and premium gasoline produced through catalytic process.

Feeding the reformer units with naphtha after pretreatment using UOP 59 and NM502 ENGELHARD. The catalysts used in units reformer section are:

R11	type	UOP
R62	type	UOP
RG	451	IFP (pro catalyst)
E803	type	ENGELHARD

BAHRAIN

A joint venture R&D program is a very promising opportunity for the region countries to cooperate to build the foundation which will enable us to take part in the catalyst production market.

However, to establish a successful joint venture R&D program it is necessary to take into consideration the competitive market, the high costs, the advanced technology and the support of highly qualified personnel required for this project. Therefore, the following need to be considered.

- Economical issues to be agreed by all concerned countries.
- Concerned countries commitment for continuous support
- Issuing of periodic progress and expenses justification reports regarding the program activities.
- Continuous cooperation between the region R&D centres.

EGYPT

Egyptian petroleum sector faced a further increasing in area of catalysts usage.

Egypt have done some efforts to build up a pilot plant for research project and also to build up another project for scientific and business cooperation in catalysts development and production.

These efforts faced only with insufficient market dealing with the production economic size.

EGYPT suggest for that new project choosing the non-licenses catalyst type for starting (mol-sieves/CaOMo₃).

IRAN

In Iran, in fertilizer industry mostly none zeolitic heterogenous catalysts are used (about 70 %). Then annual costs of the catalysts consumed by National Oil Company, NiOC, is around \$ 15.000.000. NiOC own refineries whose capacity sums up to 1.050.000 BPD. NiOC also own a petrochemical company with total capacity of around 9.000.000 T/year. We recommended that catalyst R&D start with nikel on γ -alumina because it is the most widely used catalyst in the area. In the case of zeolites preparation and testing and identification should start simultaneously. FFC zeolites can be a starting point.

We are very much in favor of the joint R&D on catalysis provided that the projects are carried out by real cooperation.

TURKEY

Catalysts have played a major role in the technological developments and innovations. To quantify the financial impact of catalysis, it is important to realize that it is not the value of catalyst materials which is important, but rather the value of products made via catalytic processes. The world market for catalysis is around \$6 billion in 1992. The chemicals and refinery products produced in the world, via catalysis is about \$2.4 trillion. As for Turkey; catalyst market is a \$15 million business.

R&D works carried out in Turkish Universities and the Marmara Research Centers mostly cover the preparation and characterization stages and there is also some testing efforts in some of the Turkish Universities. In Petkim R&D Center studies on catalyst screening, evaluation and optimization of reaction conditions are being carried out. Catalysis remains one of the most important and strategic areas of

science and technology, therefore an institute could play the role of leadership in catalyst related research to develop and eventually manufacture some of the catalysts used in hydrocarbon processing industries.

QATAR

Qatar Petrochemical Co. was established in 1974 as a joint venture between the state owned Qatar General Petroleum Corporation (QGPC). 84 % and CdF-chimie of France 16 % in 1991. Enichem of Italy has been joined QGPC as 3rd partner and a new agreement was signed to distribute the share holders composition as following for the newly formed company QAPCO:

QGPC	80 %
ECf Atochem of France	10 %
Enichem of Italy	10 %

QAPCO decided in 1992 to expand the existing steam cracking unit to increase the ethylene production from 300.000 MT/Y to 470.000 MT/Y, to construct new highly technology polyethylene to reach the production from 180.000 MT/Y upto 360.000 MT/Y and the sulphur production up to 70.000 MT/Y.

Catalysts used in low density polyethylene (organic peroxides) which are source of free radicals used as initiators for free radical polymerization.

Type of catalyst (initiators)

- Test-Butyl peroxy benzoate
- Test-Butyl peroxy 2ethylene hexancate
- Test-Butyl peroxy pivalate
- Didecanoyl peroxide

TUNISIA

Our unique refinery use two catalysts.

- One for hydrotraitement of heavy naphtha: for prepare it to reforming catalytic HYDROBON S6 them \$9.
- Second catalyst: bimetallic catalyst. Platforming VOP R50.

We used catalyst R10 then R16H then R50 since ten years ago. Now we purpose to buy new catalyst.

We traite straight run naphtha with boiling joint 90 °C-170 °C sulfur content of naphtha ~ 150 to 400 ppm. Catalyst \$9 must reduce it to 0.2-0.4 ppm.

The unity catalytic reforming run in high pressure (= 29 kg/cm²).

Our experience about catalyst: We have not direct experience with preparation, or testing but we have a rich and long experience with catalyst operating conditions and evaluation of activity's catalyst performance.

Our refinery's people establish our own logical to control and survey closely answer of catalyst, determinate the chloride level on catalyst ben and furedict the finish of cycle length. We do regeneration for both catalysts our self without service agreement's Bayer VOP

Three years ago we built Maghrebin catalyst commission between refineries in Libya, Tunisia, Algeria and Morocco. We published work about all information catalysts used in Maghrebin's refineries. Our essential purposes are:

- 1- To make up maghrebin catalyst experts.
- 2- To help one another in catalyst operating conditions, catalyst regeneration and resolve any catalyst problems.

IV. CONCLUSIONS

The region is well endowed with natural resources that provide valuable raw materials for refining and petrochemical industries. During the past decades, in the region, various industries have been established and a wealth of knowledge and expertise have been accumulated through technology transfer. However, in order to upgrade and update the already transferred technologies and to get into productions with higher added values, further technology developments are needed. As agreed upon in previous meetings on regional cooperation in petrochemical R&D, joint R&D programs on catalyst preparation, testing and identification might constitute a good ground to start such activities.

During the meeting the following conclusions were reached and recommendations were made.

1. A central facility for R&D on catalysis to serve the countries of the region through joint R&D projects will be very beneficial for the region.
2. FCC zeolites and supported catalyst are good subject areas to start the joint R&D activities.
3. To finalize the catalyst types to be handled in the R&D projects, market information particularly concerning consumption figures preferably with projections are needed. Although some information is collected during the meetings, help of GOIC, Magrep Committee for Catalysis, National Iranian Oil Company of Iran and PETKIM and TUPRAŞ of Turkey, are requested through UNIDO.

4. Cost of a 3-4 year R&D project on zeolites consisting of personnel, training, expert utilization, equipment and consumable components costs about \$ 3.800.000. Similarly cost of a 3-4 years R&D project on supported catalysts with the same components cost about \$ 3.300.000. In both cases equipment components constitute the highest amount with \$ 2.300.000 and \$ 2.350.000 respectively. Therefore to make the project more attractive financially, implementing it in an institution where majority or all of the equipment identified for catalyst preparation and testing are already present, must be preferred.
5. Turkish delegates offered Marmara Research Centre where the majority of the equipment is already present to host the R&D activities in question. This offer is welcomed and appreciated by the participants.
6. UNIDO was kindly asked to consult the other countries of the region on the same issue.
7. Although a major financial issue like equipments can be solved by implementing the R&D projects in an instutite like Marmara Research Centre there still remains financing of the projects from the points of views of personnel, training, expert utilization and consumables items which sums up to \$ 600.000 and \$ 1.000.000 for zeolitic and supported catalyst cases respectively.

8. Aware of the large potential of cooperation existing in the Middle East and North Africa in the field of catalysis used in refineries, petrochemical and chemical plants, the participants requested UNIDO to prepare a proposal for a joint regional project in catalysis. The proposal should be submitted jointly by UNIDO and concerned countries of the region to external financing sources and in particular to Islamic Development Bank for assigning the necessary funds for the implementation of the projects.

3. The joint regional R&D project requested to be prepared by UNIDO is to be formulated to secure financial involvement and participation of the scientists from the interested countries of the region.

ANNEX I

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ANNEX II

Meeting on Cooperation in the Field
of Catalysts in Middle-East and North-Africa
25-28 September 1995, Istanbul, Turkey

MEETING PROGRAMME

Monday 25 September 1995

- | | | |
|-----------|-------------|--|
| Morning | 9.00-10.00 | Registration of participants |
| | 10.00-10.45 | Official opening ceremony and welcoming addresses
- Host country official
- Head, UNIDO delegation |
| | 11.00-11.15 | Election of the bureau (Chairman, Vice Chairman, Rapporteur) |
| Afternoon | 11.15-12.30 | Presentation of the background document by the UNIDO expert and discussions |
| | 14.30-17.15 | Presentation of national papers by participant
- Bahrain
- Egypt

- Iran |

Tuesday 26 September 1995

Morning 9.30-12.30 Presentation of national papers by participants

- Qatar

- GOIC

- Algeria

- Turkey

Afternoon 14.30-15.00 Presentation of national papers by participant

- Tunisia

15.15-18.00 Discussion on joint R&D project and conclusions

Wednesday 27 September 1995

Visit to MRC in Gebze, 40 km east of Istanbul

9.30 Departure from hotel

10.30 Arrival in MRC

Lunch at MRC

16.00 Departure from MRC

Thursday 28 September 1995

9.30-12.00 Adoption of the report and closing