## OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.


## DISCLAIMER



## FAIR USE POLICY



## CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

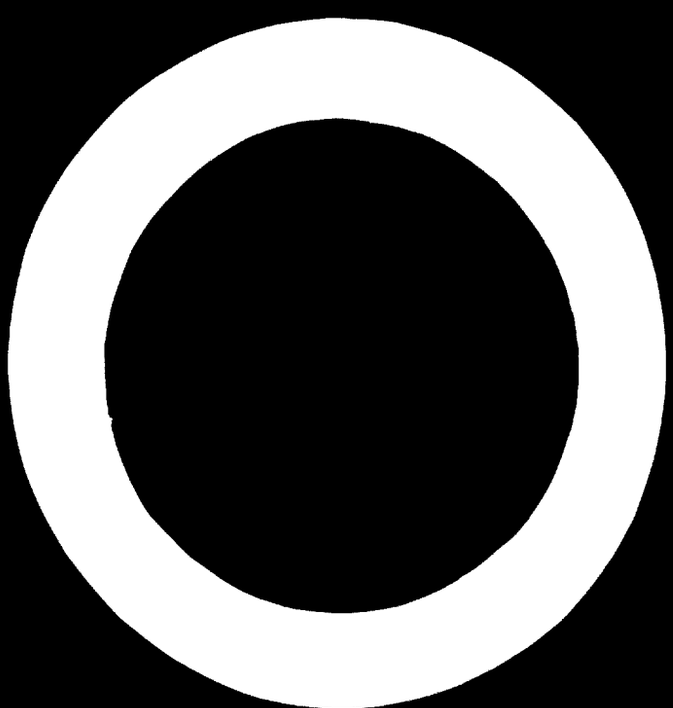
# OPERATION, MAINTENANCE, DESIGN AND MANUFACTURING OF CHEMICAL PLANTS AND EQUIPMENT IN DEVELOPING COUNTRIES

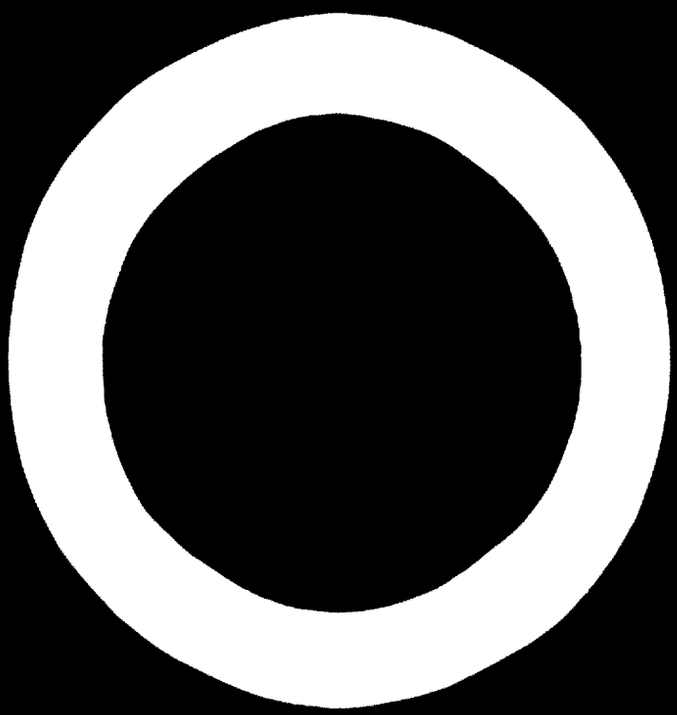
Report of UNIDO DECHEMA Seminar

Konigstein Federal Republic of Germany

25 - 26 June 1970

UNITED NATIONS





UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
VIENNA

# OPERATION, MAINTENANCE, DESIGN AND MANUFACTURING OF CHEMICAL PLANTS AND EQUIPMENT IN DEVELOPING COUNTRIES

**Report of UNIDO/DECHEMA Seminar**
**Königstein, Federal Republic of Germany**
**25–26 June 1970**

UNITED NATIONS
New York, 1970

ID/57
(ID/WG.60/15)

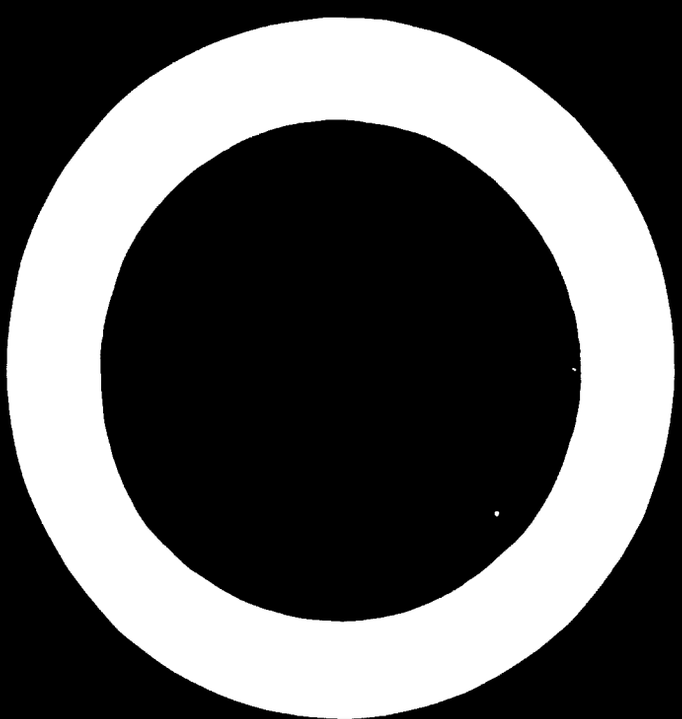
UNITED NATIONS PUBLICATION
Sales No.: E.70.II.B.33
Price: $ U.S. 0.50 (or equivalent in other currencies)

## Contents


| | Page |
|---|---|
| Preface | 5 |
| Recommendations | 6 |
| Review of the discussion | 7 |
| Realization of chemical projects | 7 |
| Manufacturing of chemical equipment | 9 |
| Operation and maintenance of chemical plants | 10 |
| Problems of quality, safety and reliability in manufacturing and maintenance | 13 |


## Annexes


| | | |
|---|---|---|
| 1. | List of participants | 17 |
| 2. | List of documents | 23 |
| 3. | Statements to the Seminar | 25 |



## Preface

1. The Seminar on Operation, Maintenance, Design and Manufacturing of Chemical Plants and Equipment was held in Konigstein (Taunus) near Frankfurt/Main, Federal Republic of Germany, from 25-26 June 1970. The Seminar was organized jointly by United Nations Industrial Development Organization (UNIDO) and Deutsche Gesellschaft fur chemisches Apparatewesen (DECHEMA).

2. The purpose of the seminar was to discuss the following problems:

(a) The over-all project planning in developing countries of chemical processing equipment production, the methodology, technology and design problems followed by problems in manufacture, maintenance and operation, particularly with regard to safety, quality and continuity;

(b) Methods to increase the effectiveness of assistance from the developed countries. The methods must be flexible to fit changing conditions in the developing countries.

3. The seminar was opened with speeches of welcome by Mr. D. Behrens on behalf of DECHEMA and by Mr. O. V. Soskuty on behalf of UNIDO. These statements are attached to the report as annex 3.

4. Mr. S. D. Bhasin (India), Mr. A. Zomosa (Chile) and Mr. H. Brauer (Federal Republic of Germany) were elected chairman, vice-chairman and rapporteur, respectively. The participants included experts from developing and developed countries and representatives of UNIDO and DECHEMA. A list of the participants is given in annex 1.

5. Ten lectures by experts from developing and developed countries were the basis for the discussions of the seminar. A list of the papers presented to the seminar is given in annex 2. The participants adopted general recommendations and also specific recommendations for consideration by developing and developed countries and by UNIDO.

## RECOMMENDATIONS

6. The seminar concluded that the rules that apply in the planning of a new production unit in a developing country are the same as those applicable in a developed country. Only well-proved processes should be introduced into a developing country. Special local conditions must be taken into account and the processes adapted accordingly.

The following recommendations were approved:

A. UNIDO should:

(1) Prepare a directory of local experts and consulting firms in developing countries that could advise foreign contractors;

(2) Prepare a directory of the available local fabrication facilities in the developing countries with particular reference to production programme, capacity, quality standards and possibilities for expansion;

(3) Advise developing countries on the introduction of internationally recognized standards;

(4) Develop a basic procedure for the preparation of invitations to submit bids and thus avoid excessive waste of time and money in preparing bid specifications and submission of bids.

B. Developing countries should:

(1) Introduce internationally recognized standards as soon as possible;

(2) Enter into new projects only if 80 to 90 per cent of the installed production capacity will be used;

(3) Investigate whether there are local facilities that could be useful in the realization of a new project and whether local manufacturers could independently or jointly perform maintenance and repair service;

(4) Plan new production projects together with shops that can do repair and maintenance work;

(5) Use these shops in the training of workers and as central service stations for several production units in the same vicinity whenever possible;

(6) Investigate carefully the supply of spare parts during the planning phase to avoid a bottleneck during the production phase that would compel the factory to shut down owing to the non-availability of spare parts;

(7) Investigate whether a common spare parts centre could be set up for several units in a developing country or possibly for units in neighbouring countries,

(8) Investigate the possibility of maintenance expert teams that would be available to several industrial projects,

(9) Organize the local production of those spare parts that are frequently replaced or renewed. (Production units for spare parts might become the future production units for chemical plant equipment.)

C. Developed countries should:

(1) Study carefully during the planning phase:

(a) The possibility of co-operation with experts and consulting and manufacturing firms in the developing countries, as well as with local subcontractors;

(b) The availability of local labour, specialists and training facilities;

(c) The availability of raw materials and power;

(d) The availability of maintenance and repair and spare parts service.

(2) Provide designs that are most suitable for the country and take into account the local climatic conditions;

(3) Avoid sophisticated designs unless they are required for established quality standards;

(4) Observe local regulations and directives on air and water pollution.

## REVIEW OF THE DISCUSSION

### Realization of chemical projects

7. The fundamental aspects of exploration and planning of chemical plants were considered in detail. The erection of

pharmaceutical manufacturing facilities at Atul, a small town 300 km north of Bombay, India was described as a case study. The basic exploration and planning of chemical plants are the same in developing and developed countries. However, there are some very important local differences. They are recognized by the weight that is attached to some of the fundamental aspects.

8. The installations should be foolproof. Therefore simple design should be used and sophisticated designs should be avoided. Automation should be limited to the minimum required for smooth operation and for the quality of the products. Automation should not be applied in order to save labour costs because the local population needs work and wages are low.

9. Special care must be taken to obtain all necessary information about raw materials. It occurs too frequently that a plant is designed for a raw material specified in the invitation for bids, and that later the plant cannot achieve its output because the properties of the delivered raw material do not agree with the specifications.

10. The timetable should be planned cautiously. It should be borne in mind that there are long periods during which the equipment is in transit. Provision should be made for unexpected delays.

11. The preparation of a model of the planned facility is adviseable. It serves two important purposes. First it can be used as a visual aid to determine the most suitable location of pipe lines and other equipment, and the planning time is shortened. The second purpose is to serve as a medium of instruction in the training programme for operating and maintenance personnel. The training should take place in the developing country and should be adapted to the local conditions.

12. To permit the initial operation of a new plant without too many difficulties, sufficient spare parts should be imported to compensate for the high rate of replacement, which might be twice the rate in industrialized countries.

13. The developing countries should be aware of the serious consequences of air and water pollution. There is still enough time for the developing countries to learn from the mistakes made in this regard by the developed countries. Unwanted by-products and wastes from chemical plants should not simply be dumped into the nearest stream or sea. They should be either converted into new starting materials or into products that will not endanger the environment.

Manufacturing of chemical equipment

14. Some European equipment manufacturers have released their programmes for the next ten years. They clearly state their intention to encourage the production of machinery and equipment in developing countries. The basic and most important economic and technical aspects for the fabrication of chemical plants in developing countries were discussed.

15. It is of fundamental importance that the type of equipment to be produced is properly selected from the extensive variety of equipment necessary for chemical plants. The selection should be based on the following factors:

(a) Investment cost distribution of standard chemical processes;

(b) Production programme considerations;

(c) Availability of local skilled labour;

(d) Availability of training facilities in the manufacturing shops for further development of local labour resources.

16. Other problems that arise are those of the size of the production facilities, the extent of administration and organization, and the requirements of highly skilled specialists. The layout and equipment necessary for a sample industrial shop were discussed. Consideration was given to production planning, organization, control and the final inspection necessary to guarantee an acceptable quality standard. The quality standard, reliability and efficiency are the bases for the reputation of a shop and guarantee its future success. It was stressed that the training and education of skilled labour for all manufacturing processes,

maintenance, inspection, testing, production planning and supervision should have the highest priority in the planning.

Operation and maintenance of chemical plants

17. The operation of a chemical plant depends on the staffing and start-up period as well as on the control and care of the plant. Careful planning and scheduling are necessary. Otherwise much valuable time will be lost and the operation of the plant may fall far short of success.

18. Planning and scheduling for safe and reliable operation start during the design stage. Experienced manufacturers develop a working philosophy as a forerunner to the final operating manual. On the basis of this working philosophy, the plant model and flow sheets are reviewed with regard to the following aspects:

(a) Accessibility both for operating and maintenance purposes, especially the location of instruments and valves;

(b) Insulation requirements;

(c) Escape routes in the case of fire etc.

19. After approval of the final design of the plant, the engineering contractor prepares a comprehensive operating manual. In the case of a multi-unit project, the manual may consist of several volumes. As an over-all guide to plant operation, the operating manual illustrates the interdependence of all the plant sections. It is a basis for training programmes for operations and for maintenance planning. The manual should be translated into the language of the local personnel to accelerate training proccesses.

20. One of the most important steps prior to the start-up period is the training of the staff that will operate the plant. A comprehensive training programme must be developed, that includes plant visits under the guidance of specialists, on-the-job training even before the plant is entirely completed and classroom instruction. Although the operating manual is the basis of the training, further instruction is necessary. The thoroughness of the training may determine the failure or success of reliable

plant operation. The importance of the training programme therefore cannot be overemphasized.

21. An orderly start-up period of a chemical plant requires close attention to the details of organization, planning and scheduling. The plant must be staffed on an around-the-clock basis with operating, maintenance and laboratory personnel and possibly an interpreter to avoid linguistic misunderstandings. Supervisory personnel should provide written procedures of the individual steps to be followed.

22. As the plant approaches normal operation it becomes increasingly important to maintain records of plant performance. Detailed performance data are of great value to decide the appropriate measures when performance has declined.

23. Chemical plants should be operated continously but planned shutdowns are necessary for maintenance and repairs. An operational, maintenance or repair crisis that necessitates a shutdown must be avoided. All shut downs should be scheduled to permit the proper organization and co-ordination of necessary activities so that personnel and spare parts are available.

24. The fundamental aspects of operation and maintenance of chemical plants were supplemented by a descriptive case study of the problems in design and engineering as well as in local procurment and fabrication for the erection of a petrochemical complex near Bombay, India. This case study made it quite clear that due to import restrictions successful construction and operation of a chemical complex depends on the availability of local manufacturing facilities. If there are none, they must be erected. Very often they are started by the companies themselves who train their own technical personnel in all aspects of design, standards, techniques of fabrication and acceptance inspection. In India there are now a large number of shops for the fabrication of pressure vessels, tanks, heat exchangers and similar equipment.

25. Even if local shops are used, many spare parts must still be imported. The value of import licences issued by the Indian

Government for operational items is always less than the original request. In most cases, the issuance of import licences is connected with obligatory purchase in specified countries from which aid or loans have been negotiated by the government. This is essentially due to the unfavourable trade balance of the developing countries, which limits the foreign exchange at the disposal of the government. From the time of the initial request for a licence, it takes about one or two years to receive the materials at the site. In view of this, spare parts for two years operation should be procured when setting up a new industry.

26. During the design and specification stage, it is preferable to use locally available "good enough" items instead of seeking "the best" which will have to be imported. In the case of items, which definitely must be imported, it is always better to have a robust, well proven design with the best possible materials rather than a design with the latest sophisticated refinements.

27. It is much more important in developing countries than in industrialized countries to solve the maintenance and repairs problem during the design and specification stage. Planning maintenance and repairs means first of all "design for reliability and easy replacement". This type of design should have special significance in the developing countries.

28. Manufacturers from developed countries can help to diminish the spare-parts problem of industries in the developing countries in the following ways:

(a) Start local manufacture of some of the more important items in the developing country either alone or in association with a local firm. Even though initially such a venture might only have marginal commercial significance, it will be beneficial to the manufacturer in the future;

(b) Attempt to erect the combination of a chemical plant and a shop suitable for repairs and the manufacture of simple equipment;

(c) Develop an inspection system in which an inspector of the contractor advises the manager in charge of the chemical plant on the planning of maintenance and repair when requested. A maintenance supervisor should be available for specific activities.

Problems of quality, safety and reliability in manufacturing and maintenance

29. Piping systems are normally not designed for the same service life as large equipment, and less corrosion allowance is normally added to the wall thickness. Piping is easy to inspect and replace, therefore it is not economical to increase the initial investment. Piping which is subjected to severe operating conditions should be carefully selected and the proper standards and codes should be applied.

30. Seamless pipe is generally used for process piping. Welded pipe is usually less expensive and can be used with adequate quality controls. But it should be borne in mind, however, that external conditions such as fires, sinking of the soil, earthquakes and road crossings might place additional strain on piping. Glass and plastic piping are not yet widely used in chemical plants in developing countries.

31. Due to a certain degree of sophistication, there is a recent phenomenon in the chemical industries of developing countries, namely that the development of instrumentation and control equipment take s place at a rather fast pace. Case studies of the production and the application of instruments for measurement and control were discussed.

32. The history of a production unit in Brazil for simple instruments was described from the initial start-up period. After it successfully overcame difficulties, the factory slowly but steadily became an important one in the Brazilian market. One of the keys to success was the maintenance and repair facilities that were set up parallel to the production unit. Special maintenance and service personnel had to be trained. Some of the best workmen from the production department were transferred to the repair shop. During the first years in Brazil, it was a losing business because of incorrect market research. The manufacturing programme had to be changed according to the requirements of the country. As a consequence many prospective customers were lost; they were later acquired with great difficulty. After

five or six years, the balance showed a positive result for the first time.

33. In India, the demand for instruments far exceeds the manufacturing capacity. Since there is a shortage of instruments, the designers of chemical plants tend to restrict the degree of complexity in the instrumentation to the absolutely essential minimum. But this inevitably increases the demand on the efficiency and performance of the manufacturer. Many visual and audible alarms are provided to compensate for the human element. The control equipment is designed to be "fail-safe".

34. Instrument manufacturers in India restrict themselves to production and do not engage in contract design and service. The following effects on design and maintenance are manifested:

(a) The designer is obliged to aim for a "Minimum adequate" concept rather than for an "optimum design";

(b) Preference is given to tried and proven equipment for which spare parts are usually available;

(c) The spare parts inventory increases. A typical figure for spare parts is 17 per cent of the cost of the installed instruments;

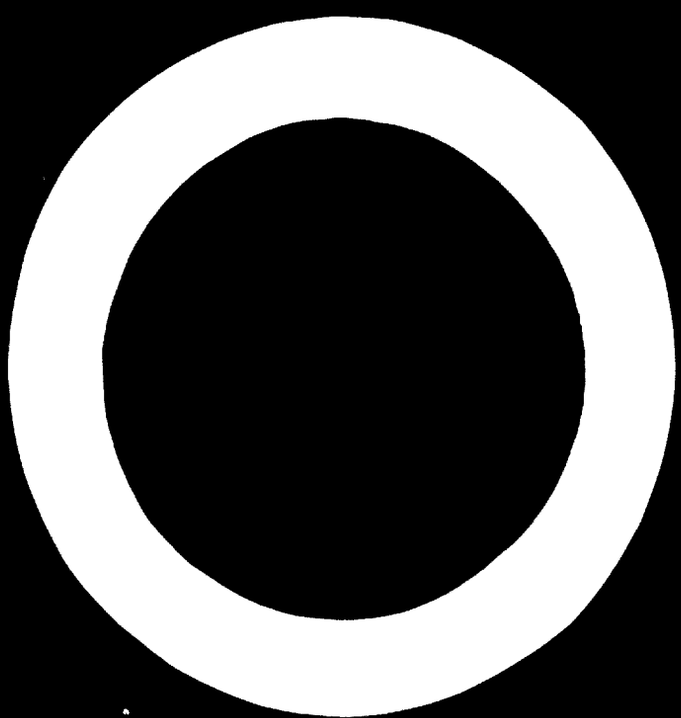
(d) A larger maintenance staff is required. A typical figure is one man for each $20,000 worth of instruments;

(e) Extensive training of craftsmen;

(f) Large investment in repair shops for a wide variety of testing and calibrating equipment.

Sophisticated construction materials are virtually non-existent and it is difficult to achieve the critical tolerance levels for some of the components. Nevertheless much progress has been made in import substitution. While a few years ago a large modern fertilizer plant would have imported almost all the instruments, a local content of 40 per cent is now possible. It is possible to equip less sophisticated and smaller plants with instruments entirely manufactured in India. However, a very close liaison with the manufacturer is necessary and frequent inspections are required.

35. Another case study discussed the production in India of electrical equipment such as switches, switchgear and fusegear as well as motors up to 11 kW and 33 kVA and 1500 kVA transformers. Parallel to the production unit, a repair shop was established for transformers, motors, switchgear and measuring instruments. The combination of production unit and repair shop has been very successful. It should be mentioned again that the repair shop offers excellent opportunities for the training of workers.



Annex 1

LIST OF PARTICIPANTS

| | |
|---|---|
| ARGENTINA | ROMERO, L.<br>Vinisa SAIC<br>Uruguay 16-5° pi<br>Oficina 31<br>Buenos Aires |
| AUSTRIA | CZEIJA, K.<br>Gusshausstrasse 12<br>A-1040 Vienna |
| CHILE | ZOMOSA, A.<br>Sociedad Quimica y Minera<br>de Chile S.A.<br>Teatinos 220<br>Santiago |
| CZECHOSLOVAKIA | HRUBY, M.<br>Forschungsinstitut für<br>Makromolekulare Chemie<br>Tkalcovska 2<br>Brünn |
| FEDERAL REPUBLIC OF GERMANY | BEHRENS, D.<br>DECHEMA Deutsche Gesellschaft<br>für Chemisches Apparatswesen e.V.<br>Theodor Heuss Alle 25<br>Frankfurt/Main |
| | BRAUER, H.<br>Technische Universität Berlin<br>Lehrstuhl und Institut für<br>Verfahrenstechnik<br>Ernst-Reuter-Platz 7<br>1 Berlin 10 |
| | DRUMMLER, F.<br>Lummus GmbH<br>Parkstrasse 10<br>6 Wiesbaden |
| | HALLER, J.<br>Siemens Aktiengesellschaft<br>Postfach 368<br>3500 Kassel 1 |

FEDERAL REPUBLIC OF GERMANY (cont.)

HÄNDLER, E.
Siemens Aktiengesellschaft
Zentralabteilung Technik
Postfach 103
8 Munich 2

HILDENBRAND, H.
LURGI, Gesellschaft für
Chemie und Hüttenwesen m.b.H.
Lurgihaus
Gervinusstrasse 17-19
Frankfurt/Main

MOSES, G.
Hartmann und Braun AG
Gräfstrasse 97
6 Frankfurt/Main

MÜHLE, J.
Technische Universität Berlin
Institut für Verfahrenstechnik
Ernst-Reuter-Platz 7
1 Berlin 10

WEISS, G.
Kreditanstalt für Wiederaufbau
Palmengartenstrasse 5-9
Frankfurt/Main

WESSER, F.
Linde Aktiengesellschaft
Werksgruppe München
8023 Höllriegelskreuth

WITZEL, K. W.
Friedrich UHDE GmbH
Postfach 262
46 Dortmund

FRANCE

LE BISSONNAIS, J.
Speichim Société pour l'Equipment
des Industries Chimiques
Rue d'Amsterdam 106
Paris 9e

GREECE

KONSTAS, S. A.
Konstas Engineering Ltd.
Platia Victorias 5
Athens (104)

**HUNGARY**

GYORI, J.
Tüskeköz 4
Budapest 2

**INDIA**

BHASIN, S. D.
I.C.I. Private Ltd.
P.O. Box 182
Calcutta 1

GOPICHAND, T.
Department of Chemical Engineering
Indian Institute of Technology
Madras 36

RAO, C. P. S.
National Organic Chemical
Industry Ltd.
P.O. Box 73
Thana
Maharashtra

SHAH, J.
Chemical Engineering World
"Jeevan Jyor"
18/20 Cowasji Patel Street
Bombay 1

SHROFF, S. D.
Shroffs Technical Services Pvt. Ltd.
Excel Estate
S.V. Road, Goregoan
Bombay 62

**INDONESIA**

PUTJAATMAKA, A. H.
Institute of Technology
Bandung

TJIOOK, T. K.
Bandung Institute of Technology
10 Djalan Ganesha
Bandung

**JAPAN**

KOMATSU COMMA, S.
Chiyoda, Chemical Engineering Co. Ltd.
Kirakawa Building
11-8 Nagatacho 1 - chome
Chiyoda-ku
Tokyo

LEBANON

KABBARA, M. Y.
Iraq Petroleum Co. Ltd.
Tripoli Refinery
B.P. 118
Tripoli

LIBYA

KAYALI, A. F.
Kayali Chemicals
P.O. Box 617
Tripoli

MEXICO

BECERRA, H. J.
Quimica Hoechst de Mexico S.A.
Arenal No.24
Mexico 20 D.F.

SANCHEZ CHAVEZ, A.
Tecnica Industrial S.A.
Depto. de Investigaciones
Ave. Universidad Norte
Apdo. Posta 755
Monterrey N.L.

PAKISTAN

DIN, G. M.
Saigol Brothers Ltd.
P.O. Box 558
Lahore

HUSAIN, M.
PCSIR
13-D Block 6
Karachi 29

SPAIN

COMAS VALLS, P.
Industrial Comas Ing.
Tecnica Quimica
Mejica 15
Barcelona 4

FLUITERS, L. M.
Cansler Iberica
Apartado 14 255
Madrid

SWITZERLAND

HUGUENIN, M.
CIBA AG
Postfach CH 4000
Basel 7

| | |
|---|---|
| TURKEY | ULAGAY, S. I.<br>I.E. Kimya Evi T.A.S.<br>Davudpasa cd. 24<br>Topkapi<br>Istanbul |
| UNITED KINGDOM | MITCHELL, N. L.<br>S.C.U.K.L.<br>Stanlow Refinery<br>Ellesmere Port, Cheshire |
| | VOS, M.<br>Kellogg International Corp.<br>Kellogg House<br>62-72 Chiltern St.<br>London W 1M 2AD |
| | WOLPERT, V.<br>24 St. John's Rd.<br>London N.W.11 |
| UNITED STATES | ARABEA, G. J.<br>4 John Circle<br>Norwood, New Jersey 07648 |
| | WICKHAM, H. P.<br>M. W. Kellogg Co.<br>711 Third Ave.<br>New York, N.Y. 10017 |

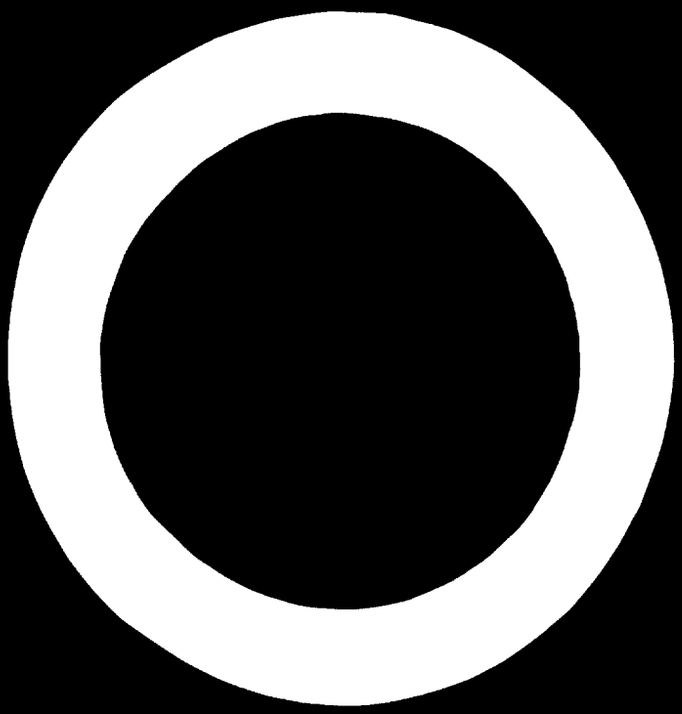
## UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

FRITZ, H. J.
Industrial Development Officer
Engineering Industries Section
Industrial Technology Division

PAVLOV, V.
Industrial Development Officer
Industrial Information and Promotion Section
Industrial Services and Institutions Division

SOSKUTY, O. V.
Chief, Engineering Industries Section
Industrial Technology Division

VERGHESE, M. C.
Chief, Fertilizers, Pesticides and
Petrochemical Industries Section
Industrial Technology Division

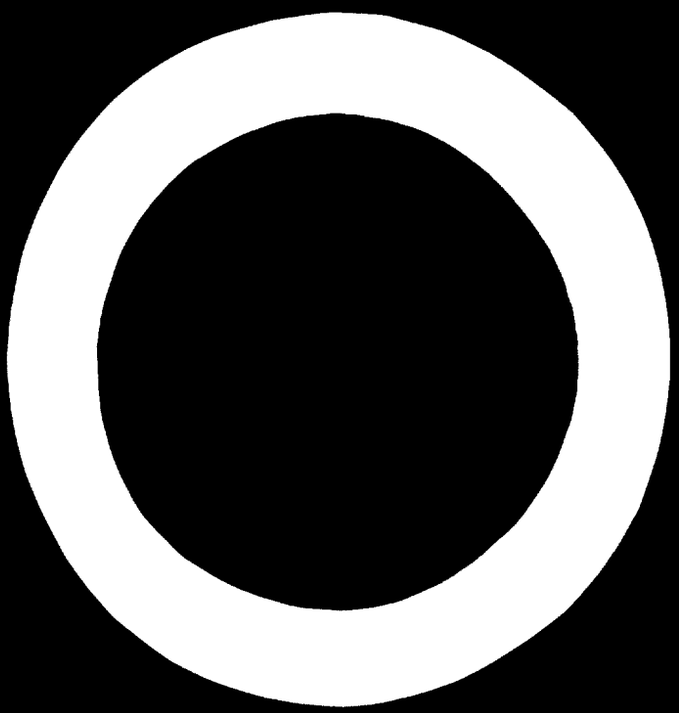


Annex 2

LIST OF DOCUMENTS PRESENTED TO THE SEMINAR[1/]

| | |
|---|---|
| ID/WG.60/1 | Provisional agenda and programme of work |
| ID/WG.60/2 | Aide-memoire |
| ID/WG.60/3 | Problems and progress of instrumentation in chemical industries in developing countries, by S. D. Bhasin |
| ID/WG.60/4 | Exploration and planning of chemical plants, by K. W. Witzel |
| ID/WG.60/5 | Operation of chemical plants in developing countries, by M. Vos, H. P. Wickham and H. O. Georgs |
| ID/WG.60/6 | Manufacturing of chemical plant equipment, by F. Wesser |
| ID/WG.60/7 | Realization of chemical projects in developing countries - case study, by M. Huguenin |
| ID/WG.60/8 | Process equipment including materials of construction, by L. M. Fluiters |
| ID/WG.60/9 | Piping systems, by F. Persch |
| ID/WG.60/10 | Instrumentation and control - from the suppliers point of view, by G. Moses |
| ID/WG.60/11 | Electrical equipment, by E. Händler |
| ID/WG.60/12 | Maintenance and repair problems of chemical plant equipment, by C. P. S. Rao |
| ID/WG.60/13 | Provisional list of documents |
| ID/WG.60/14 | Provisional list of participants |

1/ A limited number of copies are available upon request.



## Annex 3

## STATEMENTS TO THE SEMINAR

### Statement by D. Behrens, DECHEMA

On behalf of the Chairman of DECHEMA, Dr. Hellmuth Ley, on behalf of our past President, Professor Karl Winnacker and of the DECHEMA Board I wish to extend a most cordial welcome to you. You may know that DECHEMA is a scientific society which was founded 50 years ago for the advancement of the collaboration between chemists, physicists and engineers for the benefit of chemical technology. Chemical technology means for us chemical industry, apparatus construction, and also constructional materials for the manufacture of chemical apparatus. You have been able to get the best definition of chemical technology and also of the field of work of DECHEMA during the past eight days at the ACHEMA Congress. There all the equipment, laboratory apparatus and scientific equipment could be seen which signify the image of chemical technology.

But chemical technology is more than that. Developed in the proper way it will provide one of the few real chances in order to meet in the world the dangers of hunger, of poverty and of the primitive way of life. As no other technique will do, chemistry is providing many products such as fertilizers and synthetic fibres and plastics, pharmaceuticals and water purification for the direct benefit of man. It was for this reason that DECHEMA felt obliged to prepare the seminar on "Operation, Maintenance, Design and Manufacturing of Chemical Plants and Equipment in Developing Countries" with UNIDO, although this was a very difficult decision in view of the manifold tasks in connexion with the ACHEMA Congress. But we could also rely on the help and assistance of members and friends of DECHEMA. Papers will be presented by participants from Germany, Great Britain, the Netherlands, India, Spain and Switzerland. We hope that this seminar may become a link between Europe and the developing countries.

Finally I want to express my thanks to all those who have devoted so much effort to the preparation of the programme, especially Dr. Bier, Netherlands, who regrets not to be able to be with us today, Mr. Huguenin of Basel, Mr. Wesser of Munich and Mr. Witzel of Dortmund. And we should not forget the staff of the "Haus der Begegnung" who have placed the rooms for this meeting at our disposal.

The landscape in which you are spending these two days is a lovely part of Germany. It has been formed by history for only a few kilometres from here was the border between the Roman Empire and Germanic tribes. This frontier not only was a fortified wall, but it became a meeting place of different peoples, different cultures and different systems. The fortified border disappeared long ago; remaining is an amalgamation of the Roman and Germanic worlds which have influenced the essential character of this area. May it be a good omen for our meeting here in Königstein.

## Statement by O. V. Soskuty, UNIDO

This meeting has been convened by the two organizations UNIDO and DECHEMA to take advantage of the presence of the large number of experts gathered in Frankfurt for the ACHEMA Congress and Exhibition. The purpose of this seminar is to concentrate, in the very short time at hand, on the processing apparatus and equipment industry in developing countries.

I would like to say a few words about UNIDO, a relatively new agency of the United Nations, which was created in 1966. The purpose of UNIDO is to assist the developing countries in their industrialization. It must carry out its function essentially on the basis of meeting urgent needs of the developing countries and accelerating their industrial development through operational and promotional activities supported by relevant research. Within this framework, our responsibility includes

design, manufacture, operation and repair and maintenance of industrial equipment and plants. UNIDO is helping to promote industries by providing experts and equipment, by organizing institutes of design and applied research, by designing small industrial plants and, in general, by promoting an exchange of ideas and a transfer of technology in co-operation with the governments and industries. This seminar is concerned with the recommendation of guidelines for developing and industrialized countries and for UNIDO in the development of the apparatus and processing equipment industry.

The exchange of ideas between experts from the industrialized and developing countries is of fundamental importance. For while the industrially advanced countries have the know-how of technology and management, one must also take into account the direct experience of the developing countries in establishing industries under difficult conditions. There is no doubt about the important role which the chemical equipment and apparatus industry plays in the economy of a country. In the first place, few other industries cover such a wide field of technology and manufacturing processes or use so many different raw materials. Few other industries require so many different machines and production equipment and apparatus. If the chemical and processing industry is to be able to expand according to the needs of the developing countries, the equipment and apparatus must first be made available. Unless there is an improvement in the ability of developing countries to build wholly or partially the equipment and apparatus for the chemical industry, both the chemical and processing industries will fall short of their goals.

Another benefit accompanying the establishment or improvement of the equipment and apparatus industry is the effect this industry has on the people engaged in it. Teamwork and co-operation must be all-pervasive throughout the wide field of industrial effort that is set in motion by this industry. We believe it is in this co-operation on all levels of authority -

be it in manufacturing and plant engineering, apparatus design, process engineering, quality control or safety engineering - that competence and adequacy must be assured. This will result in decreased costs, expanded production and added value in the entire manufacturing process.

Your terms of reference are indeed broad, covering the whole spectrum of problems connected with the processing apparatus and equipment industry. We very much hope that you will devote most of your time to those questions which have direct bearing on improving this industry in the developing countries. There are other aspects too that must not be neglected. Wherever machinery and apparatus are in use, their repair, servicing and maintenance must go hand-in-hand with their operation. It is at this point that many of the young men will first come under the discipline of industry. It is most important that they learn their trade in a well-organised environment. There are great opportunities in the development of the chemical apparatus and equipment industry to diversify manufacture so that countries may co-operate to their mutual advantage. We must be aware at the same time, however, that progress comes from within; it cannot be imposed from without. Men must want to progress before they can move forward; they must share in the building of the apparatus and equipment before they can truly share in the satisfaction from the product output of the plants and industries. They will want to reach out for the opportunities which they see unfolding before them. In this lies much of the hope that sustains us in what we are doing.

It is our hope that the Seminar will bring forward suggestions and concrete recommendations towards the development of the chemical and equipment industry and a closer co-operation between industrially advanced and developing countries in this field.

In closing, let me express special thanks to DECHEMA, for their contribution to the organization of the Seminar and for being such a generous host to the participants.

On behalf of UNIDO, I extend to you our sincere good wishes for the work you have to do and for the fulfillment of the purpose of this meeting.

Printed in Austria

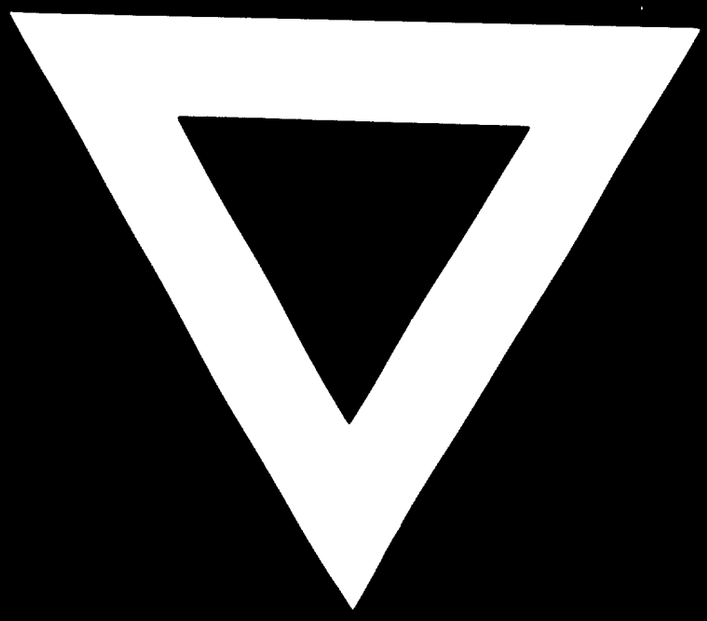
Price: $U.S. 0.50
(or equivalent in other currencies)

United Nations publication

70-5271—December 1970—3,900

Sales No. E.70.II.B.33

ID/57



23. 6. 72