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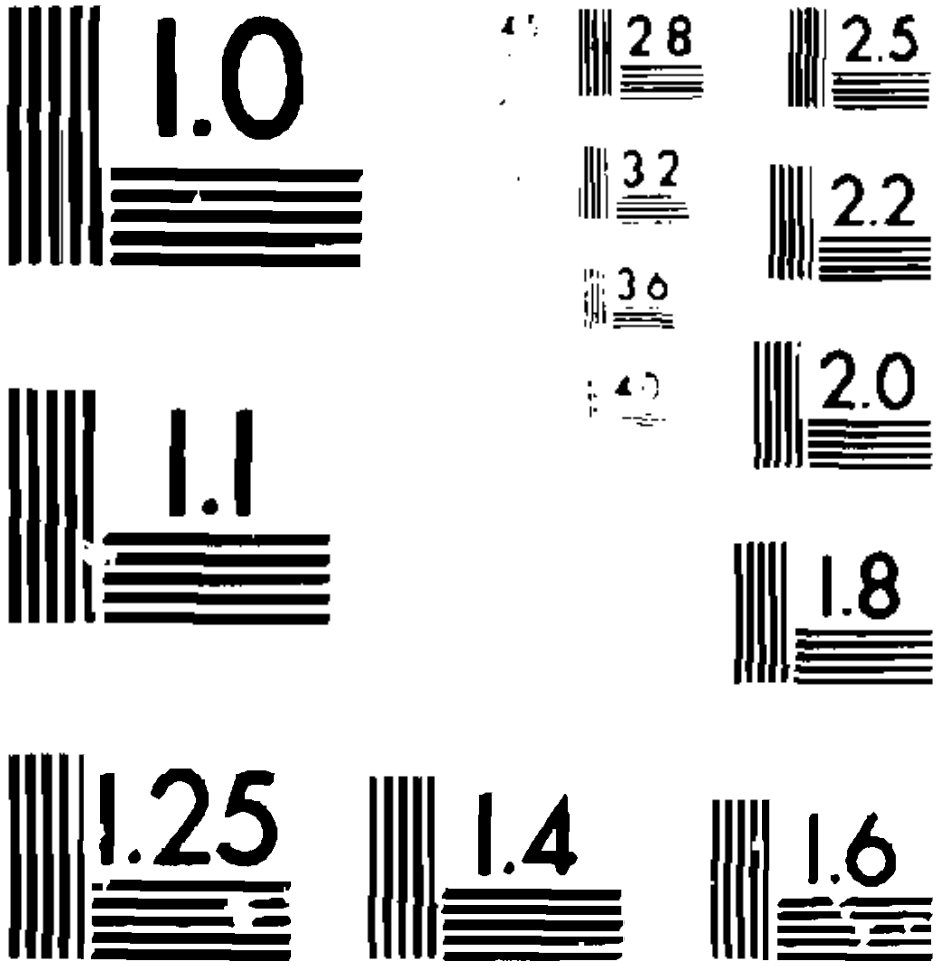
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org



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FINAL REPORT

ON THE

TENTH

TRAINING PROGRAMME

ON THE

PRODUCTION AND APPLICATION

OF

SYNTHETIC FIBRES

US/INT/83/071

L. MACHHERNDL

1983

Project No. US/INT/83/071

10th In-Plant Training Programme in the Field of Production and Application of Synthetic Fibres, Vienna - Austria

A Decade of UNIDO-Courses

In 1983 the Programme in the Field of Production and Application of Synthetic Fibres was held for the tenth time.
The organizers are proud of the fact that the courses have proved their attraction during this decade.
Within this period 110 experts from 43 countries have undergone a special training at the HBLVA Wien V.
As in the previous years, the Austrian Chemical Fibre Institute has successfully managed both the organizational and administrative work. At the same time it has arranged for the participants to get a practical training at companies of the Chemical Fibre and Textile Industry.
This year the organizers have attached great importance to confronting the participants with problems concerning raw materials, production of energy and environmental protection, as well as questions of transfer of technology ant the economical consicerations connected with them.
The participants of the 10th course were given the opportunity to take part in the festivities held on the occasion of the 225th anniversary of this school - the oldest higher technical school in Europe - and they were also introduced to Austria's president Dr. Rudolf Kirchschläger.

Höhere Bundes- Lehr- und Versuchsanstalt für
Textilindustrie Wien V.,
Spengergasse 20, A-1050 Vienna, Austria
Österreichisches Chemiefaserinstitut
Plößlgasse 9, A-1040 Vienna, Austria

Director: H. WIEHART
Managing Director: R. KATSCHINKA

Tenth Training Programme on the Production and Application of Synthetic Fibres.

Organized by the United Nations Industrial Development Organization (UNIDO) in co-operation with the Government of Austria,
Austrian Federal Chamber of Commerce,
Association of Austrian Industrialists,
Höhere Bundes- Lehr- und Versuchsanstalt für Textilindustrie Wien V and
Österreichisches Chemiefaserinstitut, Vienna

Held in Vienna, Austria
from 11th October - 7th November 1983

Final Report

by
L. MACHHERNDL
Executive Manager

C O N T E N T

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1. Acknowledgements

The Höhere Bunes- Lehr- und Versuchsanstalt für Textilindustrie Wien V and the Österreichisches Chemiefaserinsitut wish to express their appreciation to the UNIDO for organizing this training programme and for the excellent and successful co-operation.

Our thanks are specially directed to
Mr. D. A. Butaev (Director of Industrial Operation Division, UNIDO)
Mr. H. May (Deputy Director, Division of Industrial Operations, UNIDO)
Mr. R. Gumen (Chemical Industrial Branch, UNIDO)
Mrs. I. Lorenzo (Head, Training Section, Industrial Operations Division, UNIDO)
Mr. P.F. Knotter (UNIDO Investment Promotion Service)
Mrs. A. UCHIDA

At the same time we give our thanks to the Austrian authorities and corporations, whose aid, preparatory work, valuable aid and understanding enable us to achieve a remarkable effect of the training programme.

Austrian Federal Chancellery
Mrs. B. Dekrout
Austrian Federal Ministry for Foreign Affaires
Mr. E. M. Schmid
Austrian Federal Ministry for Educations and Art
Mr. W. John
Mr. O. Tischler
Mr. D. Uyka

Austrian Federal Chamber of Commerce

Mr. H. R. Seidl

Mr. K. Haas

Mr. G. Tscherne

Assiciation of Austrian Industrialists (VÖI)

Mr. P. Kapral

Mr. H. Krejci

We also are indebted to the Austrian Companies which we visited to complete our training programme.

2. Background and Objectives

The background and objectives of the training programme were stated in the Aide Memoure from March 1983 circulated by UNIDO follows:

The programme, organized by the United Nations Industrial Development Organization (UNIDO) in co-operation with the Government of Austria, os one of a series of UNIDO Training Programmes on specific sectors of industry for engineers from develcping countries. The programme will be carried out by the Federal Institute for Higher Education and Research for Textile Industry (Höhere Bundeslehr- und Versuchsanstalt für Textilindustrie HBLVA, a leading technological institute in the field of textile technology. The programme is the tenth in a series of programmes implemented annually since 1974.

The trend of training activities in the field of production and application of synthetic fibres is characterized by increasingly sophisticated nature of the training programme requiring high level experts, consultants and modern specialized equipment. Consultation meetings at plants and companies to deal with specific technological problems are also an important feature of current training activities.

UNIDO implemented some technical assistance projects and held meetings in the field of synthetic fibres and this experience can be available for the developing countries through the training programme.

During the last decade, research and development work in the field of man-made fibres has been largely geared to rationalization and modification, and the fibre manufacturers have endeavoured to introduce new products on the market. The following types of synthetic fibres can be produced:

aromatic polyamide fibres, whoch include a number of variations suitable for special fields of application, carbon fibres, produces by pyrolysis of cellulose, or polyadrylonitrile fibres under specific conditions. Carbon fibres are at present used solely as reinforcement for a wide range of matrix materials, polytetrafluoroethylene is one of the most stable polymers known. The properties of the major fibre types such as polyamide, polyester, cellulose and polyacrylinitrile have also been midified recently. Taking inot account environmental pollution and energy problems, research centres throughout the world are also working on new technologies including new solvent systems, new processing curing dyeing and finishing.

The development countries as a result of the increasing demend from the internal and external merkets for synthetic fibre products and the availability of comparatively cheap labour, have established sysnthetic fibre industries which are rapidly expanding. A number of these countries lack the required raw materials, financial resources and know how to start fibre synthesis, in oder to meet to growing needs of the processing of synthetic fibres, for which the acquistion and introduction of new technical develoments in the field are important.

The objective of this training programme is to broaden and upgrade the participants professional knowledge in al relatively short time and acquaint them with problems in the synthetic fibres industry and their solution, by concentraded training programme and exchange of information with specialists in the synthetic fibre.

The programme has received the suuport of the Austrian Federal Chancellery, the Austrian Federal Ministry of Foreign Affaires the Austrian Federal Ministry of Education and Fine Arts, the Austrian Federal Chamber of Commerce and the Association of Austrian Industrialists (VÖI). The Höhere Bundes- Lehr- und

Versuchsanstalt für Textilindustrie (HBLVA) will conduct the training on its premises, utilizing its laboratiries and equipment for this purpose. The institute has a staff of highly qualified specialists.

3. Description of the Training Programme

The programme took place in Vienna, Austria from 11th October to 7th November 1983. (see appendix I for the time table).
The programme coverd the latest technological developments in the field of synthetic fibres and consisted of a theoretical part designed to up-dated the participants' knowledge on synthetic fibre technology and laboratory and in-plant studies to familiarize them with the latest developments in production and processing equipment and techniques. The main emphasis of the processing technology including fibre engineering, testing and identification and on the application of synthetic fibres for various purposes.

The Höhere Bundes- Lehr- und Versuchsanstalt, gave full co-operation in running the theoretical and practical courses on its premises utilizing its laboratories and equipment for this purpose (See appendix II for details of lectures and appendix III for equipment used in the practical classes.)

The institute's staff of hoghly qualified specialists took full charge of the lectures, demonstrations, laboratory word, discussions, in-plant training programme and plant visits. (See appendix IV for list of staff members who participated in the training programme.)

In addition to the course conducted at the Institute plant visits in Austria were arranged to provied an opportunity for the participants to see some new develoments in materials, processes and applications, to exchange technical information with experts as well as to study the possibilitiers of obtaining licenses and knowhow on processes as well as equipment. (See appendix V for details of in-plant training and plant visits.)

The training programme was attented by participants each from the following countries:

Guyana, India, Korea, Peru, Somalia, Tanzania, Uganda and Yeman.

During the course of the training programme individual appointments were arranged for interested participants to discuss with UNIDO staff members problems affecting the development of synthetic fibre industry in the participants home country.

A programme of social activities was organized by HBLVA and other sponsors for the benefit of the participants. (See appendix VII for details of social activities)

Home countries of participants in the training programme on the production and application of Synthetic Fibres 1974, 1975, 1976, 1977, 1978, 1979, 1980, 1981, 1982 and 1983 see appendix VIII.

Appendix I

Agenda and programme of work

Opening Ceremony: 11th October 1983, Conference Room III

15:00 - 16:00	Chairman pro tem:	Mr. R. Gumen Chemical Industries Branch Division of Industrial Operations UNIDO
	Opening speech:	Mr. H. May Deputy Direcotr, Division of Industrial Operations, UNIDO
	Speeches by:	Dr. Franz Schmid Alternate Permanent Representative of Austria to UNIDO
		Mr. K. Haas Director, Austrian Federal Economic Chamber
		Prof. H. Hubeny, Technical Direcotr, Laboratory for Plastics Technology - LKT-TGM
		Dr. R. Katschinka Director, Austrian Man-made Fibre Institute
16:00 - 17:00		Dr. L. Biritz Reception given by UNIDO Official Function Room in front of VIC Restaurant

Wednesday, 12th October- Thursday 3rd November 1983

09:00 - 12:00 and 14:00 - 17:00	Lectures at Höhere Bundes- Lehr- und Versuchsanstalt für Textil-industrie In-plant training and plant visits, laboratory work

Friday, 4th November 1983

15:00 - 18:00	Final Session at HBLVAT, Vienna Discussion about national problems

Appendix II

Details of Lectures

Subject	Hours
Man-made Fibres. Their Development and Economic Significance H. Krässig, Doz. A.o.Univ.Prof.Dipl.Ing.Dr.Dr. habil, Director of the Research Department of Chemiefaser Lenzing AG, Lenzing	2
The Modern Methods of Fibre Manufacturing H. Krässig, Doz.A.o.Univ.Prof.Dipl.Ing.Dr.Dr. habil, Director of the Research Department of Chemiefaser Lenzing AG, Lenzing	2
Polymer Chemistry and Polymer Physics in the Relation to Synthetic Fbires W. Lebensaft, Dr., Member of the staff of the Höhere Bundes- Lehr- und Versuchsanstalt für Textilindustrie, Wien V	3
Chemistry and Technology of Cellulosic Staple Fibres and Dilaments R. Färber, Dipl.Ing. Erste Österreichische Glanzstoff-Fabrik AG, St. Pölten	1
Polyacrylic Fibres K. Weinrotter, Dr, Research Department Chemiefaser Lenzing AG, Lenzing	3
Processing of Synthetic Fibres and Blends Fibre-Blends and their Properties J. Hördler, Dipl.Ing. Member of the staff of the Höhere Bundes- Lehr- und Versuchs-anstalt für Textilindustrie, Vienna	2
Production of Polyamide Filaments H. Steffens, Dr. Head Research Department Enka Glanzstoff, Kassel	3
Quality-Control of Man-made Fibres. Principle and Methods F. Puchegger, Dr. Chemiefaser Lenzing AG Lenzing	2
The Economic and Technical Future of Man-made Fibres H. Krässig, Doz.a.o.Univ.Prof.Dipl.Ing. DDr. habil, Director of the Research Department of Chemiefaser Lenzing AG, Lenzing	2
Survey on Polyester Fibres, their Chemistry and Technology G. Peters, Dr., Managing Director of Austria Faserwerke, Lenzing	1 1/2

Subject	Hours
The TREVIRA^{R} Sortiment - its Properties and Fields of Application H. Zimmermann, Dr., Farbwerke Hoechst AG Frankfurt	1 1/2
Physical Methods of Fibre Modification W. Herzog, Dipl.Ing., Member of the staff of the Höhere Bundes- Lehr- und Versuchsanstalt für Textilindustrie, Vienna, Head of Austrian Textile Research Institute Vienna	3
Chemical Mehtods of Fibre Modification H. Lass, Dr., Member of the staff of the Höhere Bundes- Lehr- und Versuchsanstalt für Textilindustrie, Vienna	3
Man-made Fibre Development - Raw Materials and the Environment W. Albrecht, Head of Textile technology Institut of Enka Glanzstoff AG, Wuppertal	2
Polypropylene Fibres G.F. Hüttner, Chemie Linz AG, Linz	3
The Burning Behaviour of Textiles-Textile Floor Coverings H.P. Bauer, Ing., Austrian Textile Research Institute, Vienna	2
Pretreatment of Synthetic Fibres and Blends for Dyeing and Printing L. Machherndl, Dr., Head of the Department for Textile Chemistry at the Höhere Bundes-Lehr- und Versuchsanstalt für Textilindustrie, Vienna	2
Dyeing of Synthetic Fibres and Blends W. Lebensaft, Dr., Member of the staff of the Höhere Bundes- Lehr- und Versuchsanstalt für Textilindustrie, Vienna	2
Engineering Aspects to be Considered for the Construction of Plants, Producing Man-Made Fibres in Developing Countries H. Meißner, Dr., Uhde GesmbH, FRG Bad Soden	3

Subject	Hours
The Textile Industry form an international and national Point of View H. Huber, Dr., Hauptgeschäftsführer des Fachverbandes der Textilindustrie, Vienna	2
Man-made Fibres for Technical Purposes H. Hailwax, Ing., Management Department of Erste Österreichische Glanzstoff-Fabrik AG Vienna	3
Transfer of Chemical Technology in Developing Countries K. Czeya, Dozent, Dr., Dipl.Ing.. Wien	2
Alternate Energy Sources A. Schmidt, o.ö. Univ.Prof.,Dr. Dipl.Ing. University of Technology, Vienna	2

Appendix III

Synthetic Fibre Testing Equipment used in the Training Programme

VIBROSKOP; Linear density of fibres
MICRNAIRE, linear density of fibres
AIR-FLOW, linear density of fibres
JOHANNSEN-ZWEIGLE, fibres length distribution by array method
USTER, fibre length and length distribution automatically working
INSTROM, breaking-strength and elongations yarns, fabrics
USTER-DYNAMOMETER, breaking-strength and elongations yarns automatically working
TWICK-TEXTIMAT, breaking-strength and elongations yarns, automatically working
ZWICK-Tearing-tester
TWIST-Tester
PRESSLEY-Tester, strength of fibres, bundle method
BURSTING-Tester, VEB Rauenstein
THICKNESS-gage
USTER-Testing equipment (Uneveness of textile strands)
ABRASION-Tester
AIR-PERMEABILITY-Tester
RANDON tumble pilling Tester
ACCELEROTOR
SCANNING ELECTRON MICROSKOP, PSEM 500, Philips
PRETEMA-Spectromat FS 3 A (Filterspectrophometer) Colour measurement, Pretema, Switzerland
FIXOTEST
XANOTEST Original Hanau Quarzlampengesellschaft, BRD
LINITEST
PRAXITEST
LABOR-STENTER, LABOUR-PADDING Machine, E. BENZ, Switzerland
EPPRECHT RHEOMAT 15, Contraves, Switzerland

FLAMETESTER; Ahiba, Basel Switzerland
INFRARED-SPECTOPHOMETER 197, Perin Elmer
GASCHROMATOGRAPH SIGMA 3, Perkin Elmer
SPECTROPHOMETER PM Q II; C. Zeiss, BRD
ELEEPHO; Zeiss, BRD
HT-Dyeing apparatures, Scholl; Switzerland
HT-Dyeing apparatures, Ochsner, Austria
HT-Yet dyeing machine, Then, BRD

Appendix IV

Staff of the Training Programme

Director: Dipl. Ing. Mag. rer. nat. H. Wiehart
Managing Director: Dr. R. Katschinka
Executive Manager: Prof. Dr. techn. Dipl.Ing. L. Machherndl
Scientific Adviser: Director Doz. A.O. Univ.-Prof. Dipl.Ing. DDr. habil. Hans Krässig
Public Relations and Social Engagements: Ing. R. Hetzer
Plant Visits: Dr. R. Katschinka

Lectures: Dr. W. Albrecht
Ing. H. P. Bauer
Doz. Dr. Dipl. Ing. K. Czeja
Dipl. Ing. R. Färbar
Prof. Dr. M. Hackauf
Ing. H. Hailwax
Prof. Dipl.Ing. Herzog
Prof. Dipl.Ing. J. Hördler
Dr. H. Huber
Dipl.Ing. G. Hüttner
Univ. Prof. Dipl. Ing. DDr. habil. H. Krässig
Prof. techn. Dr. techn. Dipl.Ing. H. Lass
Prof. Dr. techn. D.M.Sc. W. Lebensaft
Prof. Dr. techn. Dipl. Ing. L. Machherndl
Dipl. Ing. A. Meissner
Dr. G. Peters
Univ. Prof. Dr. Dipl. Ing. A. Schmidt
Dr. H. Steffens
Dipl. Ing. H. Weinrother
Dr. H. Zimmermann

Assistance and Preparation: Ass. Ing. F. Foukal

M. Fried	H. Neufingerl	H. Stütz
G. Gschmeidler	R. Nothelfer	
A. Luger	J. Pichler	

Appendix V

In-Plant training and plant visits

To the special interes of the participants inplant training at fibre producing companies and plant visits to fibres-using companies during the four week course were organized.
The selection of the companies gave an regional and technical survey on the Austrian man-made fibre-producing and using industry:

1) Erste Österreichische Glanzstoff-Fabrik AG, Viscose fibres, Rayon	A-3100 St. Pölten
2) Chemiefaser Lenzing AG Pülp, Viscose Staple fibre, Acrylic staple fibres, Paper Sodiumsulfate, Sulphuric acid, Synthetic sheets and foil strips Machinery for processing Synthetic sheets, Laboratories	A-4860 Lenzing
3) Austria Faserwerke GesmbH	A-4860 Lenzing
4) Linz Textil AG Spinning and weaving mill	A-4020 Linz
5) Schiffswerft Linz AG Plastic Machinery	A-4020 Linz
6) Baumann, Textile Printing Factory	A-3950 Gmünd
7) Schiel Seide AG	A-3813 Dietmanns
8) Triumph International AG	A-2700 Wr. Neustadt
9) Chemie Linz AG Filaments, Spun Fibres, Sheets Non-wovens, Fertillizers, Pharmaceuticals, Laboriatories	A-4020 Linz

Appendix VI

P A R T I C I P A N T S

Country	Name	Address
GUYANA	LUCAS, Mr. Ronald Francis	c/o Mr. C. Davis, UNDP Resident Representative P.O.Box 1o96o, Georgetown
INDIA	PATEL, Mr. Shri K.G.	c/o Resident Representative UNDP, P.O.Box 3o59, New Delhi 110003
KOREA, Dem. People's Rep.	KIM CHANG IL, Mr.	c/o Mr. F. Murusic, UNDP Res. Rep. P.O.Box 27, Pyongyang
PERU	DULANTO, Mr. Humberto Vicente	d/o Mr. H.F.S. Bittencourt UNDP Res. Rep. P.O.Box 4480 Lima
SOMALIA	YUSUF SULEIMAN Mr. Ahmed	c/o Mr. R. A. Borthwick, UNDP Res. Rep. P.O.Box 24 Mogadiscio
TANZANIA	MBAGO, Mr. Ernest Hiza Yohana	c/o Mr. D. Quattara, UNDP Res.Rep., P.O.Box 9182 Dar-es-Salaam
UGANDA	KADUMUKASA, Mr. Edward	c/o Mr. T. Johansson, UNDP Res.Rep., P.O. Box 7184 Kampala
YEMAN, Peop. Dem. Rep. of	SALEH OBIED,Mr. Abdulla	c/o Mr. A. Surani, UNDP, Res. Rep., P, O. Box 1188, Tawahi, Aden

Appendix VII

Social Activities

1. Trip to the Wachau. Visit to the Monastery of Melk.
2. Sight-Seeing Tour in Vienna
3. Visit to the Opera
4. Visit to the Empiral Chapel (Hofburgkapelle)
5. Visit to the Fortress of Kreuzenstein and the Monastery of Klosterneuburg
6. Visit to the Spanish Horse Riding School
7. Visit to the Monastery of St. Florian
8. Farewell Party at Sievering
9. Private Invitations
10. Visit to the "Schatzkammer"
11. Visit to the Museum of Arts

Appendix VIII

Home countries of Participants

	74. 1.	75. 2.	76. 3.	77. 4.	78. 5.	79. 6.	80. 7.	81. 8.	82. 9.	83. 10.	Total
Afghanistan									1		1
Argentina	1				1						2
Bangladesh	1		1		1	1			3		7
Bolivia				1			1				2
Brazil	1				1		1	1	1		5
Bulgaria	1								1		2
China							1	1			2
Colombia				1		1					2
Costa Rica			1								1
Egypt	1	1	1	1	1	1	1		2		9
Ethiopia				1	1			1			3
Ghana			1	1		1	1				4
Guyana										1	1
India		1			2					1	4
Indonesia		1	1	1					1		4
Iran	1										1
Iraq		1	2	2	2	1		1			9
Jamaica		1			1						2
Kenya						1					1
Korea		1								1	2
Lybia		1		1				1			3
Mexiko	1			1							2
Mozambique								1			1
Pakistan		1		1							2
Peru		1								1	2
Philippines	1	1		1			1				4
PLO							1				1
Poland						1	1				2
Romania	1		1		1						3
Singapore	1	1	1								3
Somalia										1	1
Sri Lanka				1		1					2
Sudan									1		1
Syria			1			1	1				3
Tanzania								1		1	2
Thailand				1	1	1	1				4
Turkey	1		1			1		1			4
Uganda										1	1
Uruguay			1								1
Yemen A. Rep.									1		1
Yemen VR										1	1
Yugoslavia	1										1
Zambia									1		1
	12	11	12	14	12	11	10	8	12	8	110

The UNIDO in Vienna has to be congratulated in bringing about this Training Programme and we want to express our appreciation to all UNIDO-members who have contributed to the realization of this project.

We hope that we could fulfill the intentions of UNIDO by giving the participants as much as possible of insight, knowledge and experience.

We also want to give our thanks to the participants for their co-operation and wish them an effective evaluation in their native countries.