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LKT

Laboratory for Plastics Technology

19466

FINAL REPORT

**1st UNIDO/AUSTRIA SECTORIAL
CO-OPERATION PROGRAMM ON
POLYMER ENGINEERING**

AUSTRIA

1991

IIT Laboratory of Plastics Technology Austria/Vienna



LKT

Laboratory for Plastics Technology

FINAL REPORT

1st UNIDO/AUSTRIA SECTORAL CO-OPERATION PROGRAMME ON POLYMER ENGINEERING

**Organized by the United Nations Industrial Development
Organization (UNIDO) in co-operation with the Government of
Austria at LKT Laboratory for Plastics Technologie**

to be held

from 28 October to 13 December 1991 in Vienna, Austria

by

**H. Hubeny
Programme Director**

**E. Helfert
Assistent Programme Director**

1. ACKNOWLEDGEMENT

The LKT is deeply indebted to the following institutions for organizing the programme and for the excellent and successful cooperation.

UNIDO:

United Nations Industrial Centre
P.O.Box 300, A-1400 Vienna, Austria
Telephone: 26310 Telegraphic Address: UNIDO VIENNA Telex: 135612

AUSTRIAN FEDERAL MINISTRY of FOREIGN AFFAIRS:

Ballhausplatz 2
1010 Wien
Telephone: 53115 3320 Telegraphic Address: 1371-0, FAX: 5354530

AUSTRIAN FEDERAL MINISTRY of EDUCATION and ARTS:

Minoritenplatz 5
1010 Wien
Tel: 53120-4219, FAX: 53120-4490

TECHNOLOGISCHES GEWERBEMUSEUM:

Wexstraße 19-23,
1200 Wien.
Telephone: 35 35 11 203, FAX: 353511204, Telex: 131824

AUSTRIAN FEDERAL CHAMBER of COMMERCE:

Haus der Wirtschaft, Wiedner Hauptstraße 65
1040 Wien
Telephone: 50105-0, Telefax: 50206-250

AUSTRIAN SOCIETY FOR POLYMER ENGINEERING (GFKT):

Wexstraße 19-23,
1200 Wien
Telephone: 35 21 06 FAX: 35 21 06 31, Telegraphic Address: 131824

THE COMMUNITY of LITSCHAU/HAUGSCHLAG:

Gasteservice Litschau, Stadtplatz 17
A-3874 Litschau,
Telephone: 02865 5385 Telefax: 02865 538514

GOLFCLUB WALDVIERTEL:

A-3874 Litschau,
Telephone: 02865 8441

2. OBJECTIVES

The Sectoral TC-Programme on Polymer Engineering is designed for professionals and newcomers to the plastics processing and application industry as an orientation course lined with bilateral follow-up projects and missions of LKT-staff in selected developing countries or regions.

The programme offers an overview to the whole field of modern achievements in polymer engineering at an industrial - not academic - level aiming at longterm capacity-building and encouraging individual efforts by implementation of specific local and bilateral follow-up activities in plastics processing, plastics application, production management, mould design, quality control, recycling and waste management.

Special emphasis in the programme will be given to improvement of operational activities of existing technical capacities, trouble shooting, as well as on the main aspects related needs of the selected participant. Part of the programme and study visits will be conducted at the plastics industries in Austria. The participants will also have the opportunity to present special topics for discussions in plenary sessions which may relate to problems encountered in their daily work in order to enable the training management to make appropriate adjustments in the programme as far as feasible.

The introductory of the programme will cover a general introduction to the plastics industry, the basic chemical and physical aspects of production of plastic materials, application of plasticsprocessing equipment and tools as well as equipment used for mould making and testing to promote the introduction of modern processing and production methods in the plastics industry.

Furthermore, the production management and the techno-economic aspects of plastics processing industry, recycling and quality control will also be covered by the programme. The emphasis of the programme, however, will be on providing possible solutions to technical and managerial problems encountered by the participants during their daily work in their respective plants. During the programme adequate time will be devoted to professional discussions related to specific problems.

3. PARTICIPANTS**Participants financed from Austria**

COUNTRY	NAME	CONTACT ADDRESS
Angola	<i>Luvuati Ngakayitu Armando Ndembo</i>	ENEPAC-C.P. 741 R.Ngola Kilwanje Luanda Angola
Egypt	<i>Mohamed Ismail Omar</i>	National Plastic CO. Shoubbra El KHEMA Egypt
Ethiopia	<i>Sara Tesfaye Kahasay</i>	ADDIS ABABA . FOAM & PLASTIC FAC- TORY P.O.Box 22971 Addis Ababa Ethiopia
Ethiopia	<i>Paulos Angello</i>	Ethiopia Plastic Factory P.O. Box 2340 Addis Ababa Ethiopia
Suriname	<i>Herman Sanches</i>	N.V.Consolidated Industries Corporation Industrieweg Zuid BR 34 P.O.Box 635 Paramaribo Suriname
Trinidad and Tobago	<i>Shazal Mohamed</i>	Metal Industries Company Limited Private Bag 121 Port of Spain Trinidad, W.I.
Uganda	<i>Eddie Senkumba</i>	SHIP TOOTHBRUSH Factory Limited P.O.BOX 5961, Kampala Uganda
Uganda	<i>Semeon Makumbi</i>	UGAGA Plastic Ltd. P.O. Box 4875 Kampala Uganda
Zaire	<i>Goede Mbela Bayama</i>	TRABET 4ème Rue, Quartier Industriel Kinshasa Limete B.P. 9030 Kinshasa I Zaire

Selffinanced participants

Thailand	<i>Suree Pisithkul</i>	Thai Plastic and Chemical Co Ltd. 19 Soi Sukhapibal 16 Pochasamingprai Rd Prapradaeng, Samutprakarn
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4. STAFF

Principal of TGM: Hofrat Dir.Dipl.-Ing. Dr.F.Plöckinger

Director of LKT: Regierungsrat AV Dipl.Ing.Dr.H.Hubeny

Assistant Programme Director: Ing.E.Helfert

Organization Committee:

AV Dipl.Ing.Dr.H.Hubeny
Ing.E.Helfert
Ing.M.Pfaffl
StR. Ing.R.Hillisch

Main Lectures:

Prof.Dipl.Ing.Dr.H.Dragaun
Prof.Dipl.Ing.H.Elmecker
Prof.Dr.H.Fischer
Prof.Ing.Dkfm.H.Graf
Ing.E.Helfert
StR. Ing.R.Hillisch
AV Dipl.Ing.Dr.H.Hubeny
Prof.Dipl.Ing. Dr.F.Mayer
FL Ing.F.Mennerstorfer
Prof. Dipl.Ing. Dr.H.Muschik
Ing.M.Pfaffl
Ing.J.Schermann
Prof.Dipl.Ing.A.Schmidt
Univ.DoZ.Dipl.Ing.Dr.E.Wogroly
Prof. Ing. Mag.H.Wolaneck

Special thanks to all assistance and promotion.

5. OVERVIEW TIME-TABLE

5.1. Theory (Plenary Sessions)

Polymer Engineering	8
Plastics Application	8
Mould Design	8
Plastics Application	8
Subtotal	32

5.2. Practice (Demonstration)

Compounding and Recycling	8
Extrusion	8
Injection Moulding	8
Quality Control	8
Trouble Shooting	8
Subtotal	40

5.3. Project Work (Workshops)

(Small group work)	
Injection Moulding and Extrusion	
Planning, processing, controlling, quality control, trouble shooting, evaluation, application.	
Special plant visit, guest lecture, group moderation.	
Subtotal	88

5.4. Follow-up Preparation

Presentation and discussions of prepared lectures by the participants, project planning, exchange of experience, lectures of participants, final evaluation, group moderation.	
Subtotal	20
GRAND TOTAL	180

6. CONTENT

6.1. Overview Theory

Polymer Engineering:

Sustainable Plastics Economy: ecology and economy
cycle process
performance and life time

plastics waste management
("Kunststoff-Entsorgungstechnik")

Material Science: classification
molecular structure
supramolecular structure
viscoelasticity

Quality control: standardization
test methods

Performance: time temperature frequency relation
aging

Processing parameters: flow behavior
chemical processes
shrinkage

Plastics Processing

Principles of Plastics Processing: classification
compounding
discontinuous processing
continuous processing
recycling

Extrusion and Injection Moulding: design and processing
parameters
dimensional stability
shrinkage
orientations and stress
calculation of case studies

Trends in Plastics Processing: new methods
automatization
material compounds

Mould Design

Principle in Mould and Die Design: elements
materials (steel,
aluminium, others)
thermal layout
applied rheology
computer aided mould
design

Injection Moulds: classification
flow path wall thickness relation
cavities
sprue design
runner design
gating
insulated and hot runner

Extruder Dies: layout
case studies

Plastics Applications : Selected Topics

Rural Application: agriculture
household
transport

Packaging: food packaging
dangerous goods

Engineering: clamp connections
press joints
design principles

Pipes and Fittings: water management
sewage pipes
gas distribution
heat transport

6.2. Overview Practice

Injection Moulding
Extrusion
Blow Moulding
Testing

6.3. Project work**Injection Moulding:**

Production of test bars with variation of melt temperature and pressure, in order to see the influence of important processing parameters on shrinkage, orientation and mechanical properties. Production of original and recycled polymer. Shrinkage controll.

Extrusion:

Pipe extrusion with different take-off speed. Extruder operating. Processing faults and their causes. Handling of extrusion plant for various products. Compounding examples. Blow moulding and film production.

Testing:

Tensile test and calculation. Hardness determination for original and recycled materials. Shrinkage tests. Melt flow index and surface controll. Temperature relations. Preparation of specimen pipe testing. Interpretations and calculations.

6.4. Special Programme**6.4.1. Fact Finding Preparation (29 November 1991)****H. Hubeny, LKT:**

Status of the 1st SECOOP Programme in Polymer Engineering.

V. Byssuk, UNIDO:

UNDP Project Organization

W. Pilz, Austrian Federal Chancellery:

Principles of the Austrian Development Cooperation

H. Rampitsch, Austrian Federal Chamber of Economy:

Economic Co-operation with Developing countries.

R. Langthaler, Austrian Foundation for Development Research:

Aspects of Regional Development.

The summary of the mind-maps is shown in tabel 1

Fact Finding Preparation (Mind-Mapp-Summary 29 Nov.1991).

UNIDO-Facilities

- UNDP-Fund: voluntary contribution to developing countries; project basis, five-year-planning; priorities set by governments (plan of government policy); support of private and government sectors, not always full use of the contribution.
- UNIDO-Fund: special industrial services for equipment, consultation, quality control, training; direct contribution to factories; limited fund.
- Special-Fund: Contributions of governments for special fields or special regions (examples: Danube countries, Africa); examples: Austria SECOOP-Programme in Polymer Engineering.
- Local and Regional Funds.
- Trust Funds: special government contributions (example: Lybia, India).
- World Bank: government support for future development.
- Technical Fields: petrochemistry; polymers; materials, quality control, new applications (examples: medical, agriculture), environmental aspects.
- Operational Fields: projects: establishing centres, factories; nucleus of development; training, equipment, consultancy (market, quality control, waste management; studies: regional, national (centres); techno-economic aspects.

Initiatives for project proposals have to come from the companies through the government and the local UNDP-office.

Austrian Facilities

- Priorities: Sustainable development (help in the begin, not for 20 years), viable institutions, efficiency; help to the poor.
- Political situation: social stability, democracy, non-violence.
- Project selection: demand, efficiency, macro-economic impact; employment, environment.
- Programme countries: Africa (examples: Uganda, Tanzania); check of the overall situation, development coordination, NGOs.
- Plastics: justification; future of plastics in the country (contradiction between protected and open market); partnership.
- Austrian Government: Federal Chancellery - Development Section (Development Coordinator) - Technical Group - Industrial Development; multilateral (UNIDO/UNDP), bilateral (NGO); project, check, execution).
- Austrian Chamber of Commerce (membership obligate, powerful export-import promotion; 200 Mio \$); Department of Foreign Trade - Trade delegates; 90 offices worldwide; support off exports and imports (commercial contacts, request of joint ventures).

Initiatives for bilateral support and development partnership in specific fields have to come from the companies through the Austrian Diplomatic Representative to the Austrian Federal Chancellery. Request for commercial projects and joint ventures has to come from the company through the Austrian Trade Delegate.

The goal of the Overview Programme for the participants is to define and to solve problems now or later, to ask finally the relevant questions and to define the way of action for their specific follow-up activities.

Tabel 1: Summary of the mind map

6.4.2. Lectures of participants

" Learning of each other is a great experience "

- 9.00 H.Hubeny: Polymer Engineering:
- cooling conditions
- degradation
- 11.00 S.Pisithkul (Asia): R&D in the field of PVC
- 12.30 S.Mohamed, H.Sanchez (America): Mould Design
- concepts and experiences
- offers
- 14.00 P.Angello, G.Bayama, S.Makumbi, E.B.Mandawa, M.I.Omar,
A. Ndembo, E.Senkumba, S. Tesfaye Kahsay (Africa):

Regional Co-operation in Plastic Technology
- experiences
- case studies
- new ideas

6.4.3. Special guest lectures (Injection moulding and Extrusion)

6.4.4. Group Work and Evaluation

6.5. Plant Visit

Grand Plant Visit

Special thanks to all companies for guided tours, support, excellent and successful cooperation.

The selection of the plants according to the interest of the participants gives a regional and technical survey on the Austrian plastic industry.

ENGEL

Ludwig Engel KG
Maschinenfabrik

field injection moulding machines

A-4311 Schwertberg Austria
Telephone: 07262 7171-0
Telex: 02 174521
Telegramm: Engel Schwertberg

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EREMA

Engineering Recycling
Maschinen-Anlagen Ltd

field: recycling plants,
pelletising machines

A-4052 Frendorf, Unterfeldstraße 3
P.O.B. 38
Phone: 0732 311761
Telex: 22300 erema a
Fax: 0732 31176123

ACTUAL

Anlagen-, Maschinen- und
Werkzeugbau Ltd.

field: profil extrusion,
window production,
PVC recycling,
mould design,
mechanical engineering.

A-4053 Haid-Linz Austria
Phone: 7229 88 401
Telex: 2-1093
Telefax: 7229 89669

POLOPLAST

Kunststoffwerk der
Enoch&Kern&CoOHG

field: injection moulding,
extrusion, mould design

A-4021 Linz Leonding
Poloplaststraße 1, P.O.B. 1
Phone: 0732 80621-0
Telex: 02 1131 pololz a
Telegram: Poloplast Linz

LENZING AG

Plastics-Machinery
Division Austria

field: weaving machines

A-4960 Lenzing, Austria
Phone: 07672 2511-0
Telex: 026606 lenfasm a
Telefax: 07672 2511-78

GREINER INTERNATIONAL

GREINER
INTERNATIONAL
Austria Österreich

field: injection moulding,
recycling, mould design,
foam production,
food packaging.

A-4550 Kremsmünster,
Greinerstraße 70
Phone: 07583 7251-0
Telex: 21370
Telex foaming: 24455
Fax: 07583 6438

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Kunststoffwerk Kremsmünster Ges.m.b.H.&Co KG

Kunststoffwerk Kremsmünster field mould design, injection moulding.
Ges.m.b.H.&Co KG

A-4550 Kremsmünster
Kremseggerstraße 17
Phone: 07583 7471
Telex: 23467 Kus

Pollman Feinwerktechnik Ltd.

Pollman Feinwerktechnik Ltd field precision injection moulding, quality control

A-3522 Karlstein an der Thaya
Raabserstraße 1
Phone: 02844 223

CINCINNATI Milacron

CINCINNATI Milacron field single and multiscrew extruders
Austria Ltd

A-1232 Wien
Postfach 111
Laxenburgerstraße 246
Phone: 0222 61006-0
Telex: 131518
Telefax: 0222 61006-8

IFW FORMENBAU

IFW Manfred Ott, Ltd.&Co KG field mould design,
injection moulding,
welding practice

A-4863 Micheldorf
Phyrnstraße 73
P.O. Box 2
Phone: 07582 2556
Telefax: 07582 4753

BATTENFELD

Kunststoffmaschinen Ges.m.b.H. field injection moulding machines

A-2542 Kottlingbrunn
Wf Neustätterstraße 51
Phone: 02282 5365 67
Telex: 014440 bat kot

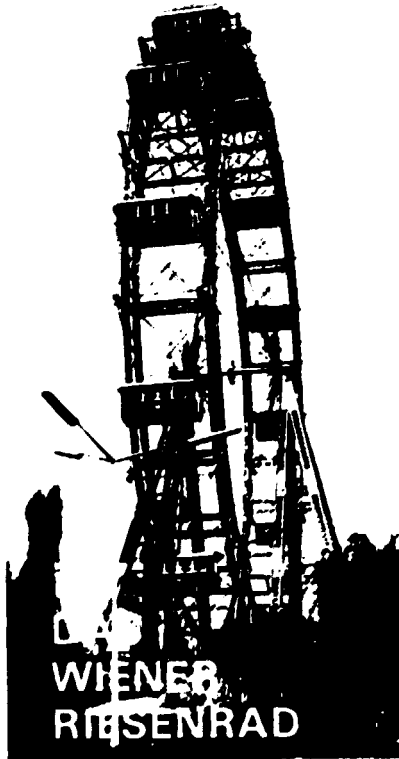
THEYSOHN EXTRUSIONSTECHNIK LTD.

A-2100 Kornuburg field extruders
Gurakstraße 2
Phone: 02262 5511 0
Telefax: 02262 5505
Telex: 113592 THEYKA

7. BACKGROUND PROGRAMME**7.1. PRATERBUMMEL with Dinner**

The "Riesenrad" (Giant Wheel) is a landmark of Austrian Capital and a symbol of the world famous Vienna "Prater". Rising its silhouette to the sky it is seen from far away-so the wheel is a special attraction for everybody coming to Vienna. Nobody could properly claim to have been to Vienna unless he had "ridden on the Wheel". In 1896-97 it was built by an English engineer, Walter B.Basset. Similar giant wheels, constructed by the same engineer, were situated in London, Blackpool and Paris, but they were soon dismantled and sold as scrap-not so this Viennese specimen.

In 1945 all the cabins and whole operating plant were destroyed by bombs and fires, but together with the rest of the Capital the Wheel was started to be rebuilt. Since 1946 it has been in constant action till today.



7.2. Folklore Weekend in the landscape "WALDVIERTEL"

Special thanks to

Frau Elisabeth Bachmann (travel service Litschau)
Frau Maria Poindi (Golfclub Waldviertel)
Hr. Mag. Hermann Holbach (general manager Golfclub Waldviertel)
Elfi (Golfclub Waldviertel)
Luki&Toni (musician)
Hr. Leopold Blaul (hiking guide)
Hr. Hannes Kainz (dancing group)
Ing. Erwin Buhl (museum of Litschau)
Hr. Herbert Schalko (Major of Litschau)
Hr. Johannes Geist (restaurant Perzy)
and the staff from Perzy.







7.3. SALZBURG – town of music and art
town of Mozart

December 5th 1991: Bicentenary of his death

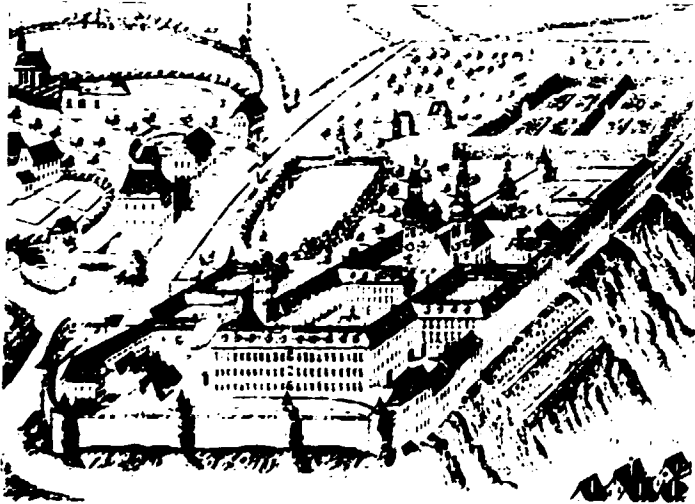
Mozart – most famous musician of Austria was born in the town
Salzburg.

The house with the address Getreidegasse 9 was built in the 12th century and it's
the birthplace of Wolfgang Amadeus Mozart.
It was also in the Getreidegasse apartment that Mozart's earliest compositions
were written.



7.4. STIFT KREMSMÜNSTER

KREMSMÜNSTER



7.5. YOUNG VIENNA

Visit the most giant disco "Nachtwerk" in Vienna.

