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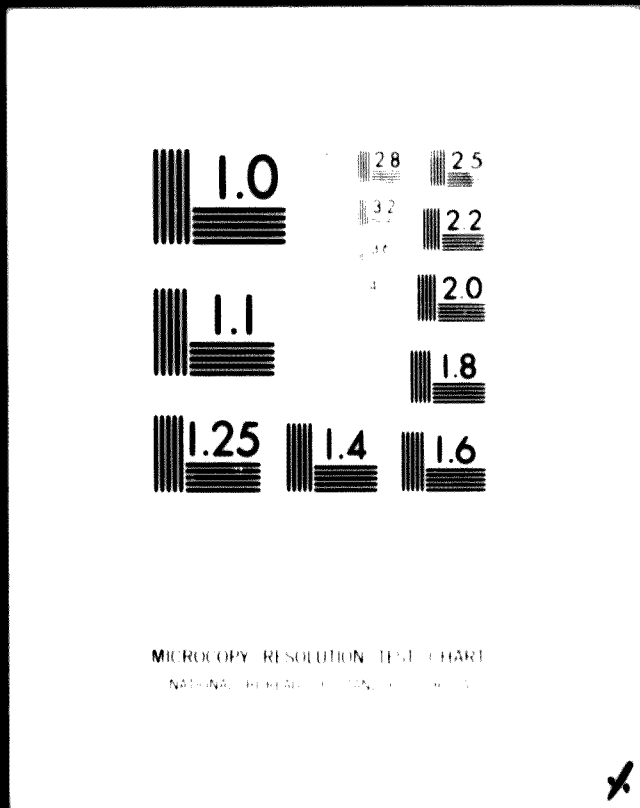
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LKT

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Report

of the

UNIDO / AUSTRIA Second Training Programme in Plastics Technology
for Developing Countries .

003139

17 May - 16 July 1971

Vienna

The LKT is deeply indebted to the UNIDO for organizing the Seminar and for the excellent and successful cooperation.

We specially want to express our gratitude to

Mr. N.K.Grigoriev
Mr. S.Quijano-Caballero
Mr. E.C.Rothblum
Mr. D.C.Newton
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Mr. H.Pichler
Mr. M.C.Verghese
Mr. H.May
Mr. J.Wischeidt
Mrs. I.Tscherne

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Austrian Foreign Office:

Mr. A.Marquet
Mr. P.Müller
Mr. W.Kristen

Ministry of Education:

Mr. W.Molzer
Mr. F.Pany
Mr. H.Rotter
Mr. J.Bousek

Austrian Chamber of Commerce:

Mr. W.Melis
Mr. N.Tiefenbacher

Austrian Federation of Industry (ÖIV):

Mr. P.Kapral

**Austrian Society for the Advancement of Plastics Technology
(GFKT):**

Mr. A.Herrman

Mr. E.Pöcksteiner

Mr. H.Margarétha

Mr. R.Bausback

Mr. H.Pröglhöf

Technologisches Gewerbemuseum:

Mr. W.Brandstetter

Mr. F.Dohnal

We have of course, also appreciated any contribution towards the Seminar, in form of free materials, lectures, invitations and visits presented to us by firms and individual persons in Austria and abroad.

Last but not least we have to thank the ORF and the Austrian newspapers for their reports.



Content

OPENING STATEMENTS	1
E.Pöcksteiner	1
H.Margaretha	2
H.Rotter	3
E.Schmitz	4
OBJECTIVES OF THE SEMINAR	5
LIST OF PARTICIPANTS	6
PREPARATION FOR THE SEMINAR	8
COURSE OF THE TRAINING PROGRAMME	9
IKT Staff	9
Time table	11
Content of lectures	12
SPECIAL ACTIVITIES	24
Plant visits	24
Supplementary lectures	24
Supplementary papers	24
Social engagements	25
EQUIPMENT	26
BUILDING	28
EVALUATION OF THE TRAINING PROGRAMME	29

E.Pöcksteiner, Austrian Plastics Association (VÖK)

Opening Statement, Mo 17/5/71, Vienna, Feldernaus

Ladies and gentlemen,

As chairman of the Austrian-Plastics-Association (VÖK) I have the honour to welcome you on behalf of this organization. This is already the second Seminar for Plastics Technology organized by UNIDO in Austria and I am convinced that you will have most interesting weeks of theoretical und practical work in our laboratories and schools.

Besides this training-course we shall certainly give you the possibility to meet Austrian plastics manufacturers and to visit Austrian factories. I do hope that this will be the begin of fruitful contacts, especially for worldwide cooperations and joint ventures.

On that occasion I would like to express my gratitude to UNIDO for giving us the chance to show you - and through you the whole world - the effidency of the Austrian plastics industry.

Welcome once more to Austria.

H.Margarétha, Association for the Promotion of Plastics
Technology (GFKT)

Opening Statement, Mo 17/5/71, Vienna, Felderhaus

It is a great pleasure for me to greet on behalf of GFKT our Society for the Promotion of Plastics Technology a new group of participants at the Second Training Programme in Plastics Technology organized by the UNIDO for developing countries.

I am glad that this is now the second seminar within a short time, because it means that the first has been a success. Since we considered the first as a trial and we hope that when the second programme has come to an end as successfully as the first these seminars will have become one of the institution of UNIDO in Austria. We also hope that our friends at the United Nations will find that more opportunities exist in Austria which could be used in a similar way.

When I looked at the list of participants and looking now at you I have no doubt about the success of this seminar. Your standard of learning, your qualifications in your work seem to be the best guarantee. It even amazes me a little bit that people of such qualifications, of such experience should be willing to go abroad, to go to school again and spend several weeks studying and training at quite an ordinary school.

We are proud that our ordinary school a type we connect with the name of Exner seems to be not so ordinary to you and even seems to attract you. Apparently this type of school a combination of theory and practical, manual work at the machines with tools in a continuous contact between school, teacher and student and industry and trade fits very well into the rapid development of technical science. The students of today will be the managers responsible for production and development in newly developing industries in countries all over the world. We are proud that with this school of ours we can attract manager-students from other countries, who will take with them knowhow they will have collected here with the assistance of this school and our industry.

WELCOME to Austria to some weeks - I hope - of PLEASANT

TRAINING

H. Rotter, Ministry of Education and Art,

Opening Statement, Mo, 1/5/71, Vienna, Felderhaus

Ladies and Gentlemen,

It is a great pleasure for me to welcome you at the opening the second UNIDO-Austria Seminar in Plastics Technology for Developing Countries. I am speaking for the Federal Ministry of Education and Art and in this function I want to tell you that Mr. Molzer, the department head of higher professional education, sends you his best respects on this occasion.

I am specially glad to observe that after the success of the first seminar last autumn a second seminar has been organized by the gentlemen of the UNIDO in such a short interval. Our guests from 14 different countries will receive 5 weeks of intensive training at the Laboratory of Plastics Technology. This Laboratory is an integral part of one of the oldest schools of Austria and has been working with an excellent team of experts on plastics processing for more than 10 years.

I want to express my best wishes to the management of the UNIDO and to the participants of the seminar. I hope for a great success, a rich gain of knowledge, and an interesting, pleasure stay in Vienna.

E.Schmitz, LKT

Opening Statement, Mo 17/5/71, Vienna, Feilderhaus

Mr. president, ladies and gentlemen,

Only a few month after the end of the first seminar we have again the pleasure to welcome participants from 14 countries at our laboratory.

Many of the participants of the autumn seminar last year are still connected to us in friendship and regular correspondence. We think of them gladly and hope for the same good cooperation with this year's seminar participants.

Whithin the next 5 weeks we shall try to give you basic information on theory and practice of plastics processing. 35 members of our staff and 15 laboratories and machine-rooms will be at your disposal. The taskes of plastics processing are so manifold, that in so a short time it is only possible to impart the most important basic principles to you and to show you all possibilities now to enlarge the knowledge in this field.

The management of the UNIDO in Vienna has the great merit of having organized these seminars and so we hope for future friendly cooperation for the prosperity of all countries of the globe.

Speaking for all members of the Laboratory of Plastics Technology (LKT), may I welcome you in Austria and in Vienna and may I also express my hope that this seminar will contribute to the progress of the plastics industry in your countries.

I hope for a good co-operation.

Background and Objectives of the Seminar

The plastics industry in recent years has had a rate of growth of approximately twenty per cent in developing countries and plastics come in the forefront of basic materials necessary for the economic development of developing countries. Most of these countries do not have the finance or know-how to start production of basic and intermediate petrochemicals but they have a large plastics fabrication industry using imported basic materials.

The principal objective is to bring together a group of selected technologists already engaged in the plastics industry and to give them a concentrated training course in modern technology of plastics fabrication and utilization which otherwise would require a long period of training and research and development work.

It is felt that the educational institutions in most of the developing countries are not sufficiently up-to-date with plastics technology. It was therefore provided that the training courses includes a period of theoretical instruction followed by practical training in laboratories including a sufficiently long period in testing of products. After this, the trainees visit industrial plants in Austria and other European countries.

LIST OF PARTICIPANTS

<u>ALGERIA</u>	KELLOU Mohammed Seghir	I.N.P.E.D. (D.E.I.) Bureau d'études 126 bis, rue didouche mourad Algier
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<u>CHILE</u>	RABAGLIATI- CANESSA Franco	Instituto Tecnologico INTEC Casilla 667 Santiago Head, Polymers and plastics group
<u>CHINA Rep.of</u>	HSIEH Youkang Connie, Miss	Union Industrial Research Institute P.O.Box 100 Hsinhu, Taiwan Supervisor of NMR Laboratory
<u>GHANA</u>	HAGAN Albert	Electronic Division of GIHOC p.O.Box 577 Tema Factory Superintendent
<u>INDIA</u>	RAJADURAI Sambosankaran	Central Leather Research Institute Adyar, Madras. 20 Scientist
<u>ISRAEL</u>	PAJNER David	Ministry of Commerce and Industry Jerusalem Head, Rubber Section
<u>MADAGASCAR</u>	ADRIANJOHANY Charles	Lot II P 73 Besarety - Tanarive Director, Furniture Factory
<u>NICARAGUA</u>	ROBELO Fabio	Quimico Borden Centroamericana SA P.O.Box 2642 Managua Production Manager
<u>NIGERIA</u>	ADEDOYIN W.Oladeji	General Metalware Co.Ltd. P.O.Box 193 Ikeja Factory Engineer

<u>PAKISTAN</u>	BASRAI Mohammed J.	M/s Bestolite Industries 17, Mitford Road Dacca Factory Engineer
<u>SINGAPORE</u> Nam Siang	OOI	School of Industrial Technology Singapore Polytechnic Rubber & Plastics Division Singapore 1 Lecturer in Rubber and Plastics Department
<u>TANZANIA</u>	EBRAHIM Murtaza J.	Ministry of Commerce and Industry P.O.Box 234 Dar es Salaam Industrial Engineer
<u>UNITED ARAB REPUBLIC</u>	EL SHARKAWY Hamed M.	Egyptian Plastics and Electrical Industries Victoria, Alexandria Production Manager

We also want to express our gratitude to the participants of the seminar for their great interest, their active open-mindedness at discussions. So it was possible to carry out the training programme with the greatest success for all persons concerned.

We hope that this first exchange of information will result in many future contacts.

We also wish the participants an effective evaluation of the seminar in their native countries.

PREPARATION FOR THE SEMINAR

After the first contacts with UNIDO in January 1969 the general and practical course of the first UNIDO/AUSTRIA Seminar in Plastics Technology for developing countries was prepared during 1970 and carried out from Sept. 14th 1970 to Nov. 28th 1970.

The evaluation of the first UNIDO/AUSTRIA Seminar, the critics of the participants resulted in a new programme of five weeks with an increasing part for testing.

After the first Seminar the new training programme was mapped out by a team of the LKT (Schmitz, Hubeny). New lecture notes about testing with 80 pages were prepared.

The lecture notes amount up to 17 books with 750 pages covering the total range of plastics technology.

COURSE OF SEMINAR

L K T STAFF

Director: FV OStR.Prof.Dipl.Chem.E.Schmitz
Executive Manager: Prof.Dipl.Ing.Dr.techn.H.Hubeny
Public Relations and Social Engagement: Ing.R.Hillisch,
Prof.Dipl.Ing.Dr.techn.E.Wogrollly

Lectures:

Ass. E.Feigl
Prof. H.Fischer
Ing.Dkfm. H.Graf
Prof.Dipl.Ing. F.Gregori
Ing. R.Hillisch
Prof.Dr. H.Hubacek
Prof.Dipl.Ing.Dr.techn. H.Hubeny
Ing. W.R.Jessenig
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Prof.Dipl.Ing. H.Revesz
Prof.Dipl.Ing.Dr.techn. J.Smelik
Fl. E.Stronmayer
Prof.Dipl.Ing.Dr.techn. E.Wogrollly
Ass.Ing. H.Wolanek

Assistance and Preparation:

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Ass.Ing. P.Naggies
T.Parzer
L.Pfeiffer
S.Pihulisk
W.Schinogl
Fl. E.Schneider
Ass.Ing. P.Tenor
Ass.Ing. P.Wenisch

TIME TABLE

The training programme included 62 theoretical lessons and 113 practical lessons in three groups, this is a total of $62 + 339 = 401$ lessons, for which 5 machine rooms, 3 workshops and 7 laboratories were provided.

Theory:

CTK	Plastics Chemical Engineering	10	
MFB	Plastics Mechanical Engineering	24	
MTK	Plastics Mechanical Technology	22	
RSA	Control Engineering	6	<u>62</u>

Practice:

AU	Compounding	4	
EX	Extrusion	20	
HZ	Machining and Forming	12	
OT	Finishing	2	
PR	Compression Molding	8	
PT	Testing	25	
RE	Computation Engineering	2	
RS	Control Techniques	8	
SH	Molding Expanded Plastics	4	
SP	Injection Molding	16	
VK	Molding Reinforced Plastics	12	<u>113</u>

Total for one group 175

CTK Plastics Chemical Technology

E.Wogrolly

1. **Classification : Chemical Composition - Molecular Structure - Physical Behavior - Processing Methods.**
2. **Formation Reactions**
 - 2.1. **Polymerization : Radical chain - Ionic chain - Polymerization.**
 - 2.2. **Polymerization Methods : Bulk Polymerization - Suspension - Solvent - Precipitation - Dispersion - Emulsion - Co-Polymerization - Craft - Auxiliary materials.**
3. **Physical Behavior of Plastics**
 - 3.1. **Secondary Bonds : Dispersion Forces - Dipolar-orientation forces - Induction forces - Hydrogen bridges.**
 - 3.2. **Transition States : Hard-elastic state - Setting or Softening range - Glass transition - Brittle Point - Elastomeric state.**
4. **Polymers : POM - PVAc - PVAC - PVC (Plasticizers, Stabilizers, Fillers, Lubricants, Pigments) - PVDC- PMMA - PS Expanded, High Impact) - Polyvinyl - Carazol - Polyvinylpyrrolidone - PE (LD, MD, HD) - PP - Fluoric Polymers - Other Polymers.**
5. **Polycondensation and Polyaddition Products**
 - 5.1. **Classic condensation reaction : Phenoplasts - Aminoplasts.**
 - 5.2. **Thioplasts**
 - 5.3. **Polymeric Esters and Ethers : CN - CA - CAB - Cellulose ethers.**
 - 5.4. **Polyesters : UP - PETP - PC.**
 - 5.5. **Polyamides : PA6 - PA66.**
 - 5.6. **Polyimides**
 - 5.7. **Epoxy Resins**
 - 5.8. **Polyurethanes**
6. **Silicones : Oils - Resins - Rubbers.**
7. **Inorganic Polymers.**

MFB Plastics Mechanical Engineering

R.Hillisch, H.Revesz

1. Extrusion

- 1.1. Extruder Plants and -Dies : Pipe Manufacturing - Blown Film - Flat Film - Sheet Extrusion - Lamination - Wire-Covering - Pelletizing Plants - Monofilaments - Profile Extrusion Plants.**
- 1.2. Pre-Set Elements : Silos - Transporting Systems - Compounding and Reworking Machines - Mixers - Kneaders - Mills - Preheating- and Drying Equipments - Vent Systems.**
- 1.3. Elements of the Extruder : Classification - Function of Screws - Feeding - Designs of Borels and Screws - Drives - bearings - Heating and Cooling - Temperature Control - Melt Pressure Gauges - Die Adapters.**
- 1.4. Annexed Equipment : Sizing Dies - Cooling - Take off - Control Devices - Signators - Preliminary Treatment - Separating Equipment - Post Forming Equipment.**
- 1.5. Principles of Extruder Die Design**
- 1.6. Plants and Molds for Blow Molding**
 - Accumulators - Tubing Dies - Orifices - Closing Units - Blowing Equipment - Severing Equipment - Ejection Equipment - Transporting - Blow Molds.**

2. Molding of Thermosets

- 2.1. Processing Techniques : Compression Molding - Transfer Molding - Injection Molding**
- 2.2. Machines : Semi-automatic Presses - Automatic Presses - Mechanical - Hydraulic Presses - Compression- and Transfer Molding Machines - Plungers - Screw Plungers.**
- 2.3. Additional Equipment : Dosing - Preforming - Preheating - Finishing.**

- 2.4. **Molds : Open Flash Mold - Positive Molds - Split Molds - Transfer Molds - Runners and Gates - Transfer Pot and Plunger Leaders - Ejector Pins - Mold Heating - Types of Steel - Special Machining Molds**
- 2.5. **Design of Compression Molded Parts**
 - Requirements - Draft of Surface - Wall-Thickness - Roundings and Ribs - Undercuts - Holes - Slots - Design of Threads - Metal Inserts.
- 3. **Injection Molding**
 - 3.1. **Techniques : Injection Molding - Injection Stamping - Flow Molding - Molding of Expanded Materials - Injection Blow Molding - Two Color Molding.**
 - 3.2. **Machines : Classification - Technical Data - Injection Units - Screw Plunger - Nozzles - Closing Units - Safety Devices.**
 - 3.3. **Additional Equipment : Material Storage - Transport - Preheating - Drying - Mixing - Dyeing - Cooling Equipments - Cutting Equipments.**
 - 3.4. **Molds: Elements - Design of Sprue, Runner and Gate - Types of Molds: Single Cavity, Multiple Cavity, Three Plate, Four Plate, Split, Side Full, Hot Runner, Calculation - Design of Molds.**

MTK Mechanical Technology

H. Hubeny

- 1. **Structure of Plastics**
 - 1.1. **Resin : Macromolecules - Molecular Weight - Amorphous and Crystalline Structure - Brownian Motion - Polarity.**
 - 1.2. **Additives : Fillers - Reinforcement Materials - Stabilizers - Plasticizers - Colorants - Lubricants - Catalysts - Antistatic Agents - Fire Retardants - Blowing Agents.**
 - 1.3. **Molding Materials**
 - 1.4. **Molded Materials**

2. Classification of Plastics

2.1. Elasticity : Energy-Elasticity, Entropy-Elasticity, Oscillating Twisting Test.

2.2. Viscosity : Newtonian and Non-Newtonian Fluids, Rheological Models.

2.3. Definitions : Thermoplastics - Thermosetting Materials - Elastomers - Thermoelastics.

3. Properties of Plastics Compounds

3.1. Characteristics

3.2. Thermoplastics: PE - PP - PB - PS - ABS - SAN - PVC - CA - CAB - PA - PUR - PETP - PC - POM - PPO - PMP - Phenoxy - Polysulfones

3.3. Thermoelastics: PMMA

3.4. Pseudo-Thermoplastics: PTFE - PCTFE - Ionomers - Polyimides.

3.5. Thermosetting Materials: PF - UF - MF - EP - UP - PUR.

3.6. Selection of Materials

4. Compounding

5. Discontinuous Processing of Molding Materials

5.1. Compression Molding : Operations - Fluidity - Temperature - Time - Preheating - Shrinkage.

5.2. Transfer Molding : Pot-Type, Transfer Molding, Plunger-Molding, Operations, Comparison.

5.3. Injection Molding : Operations - Pressure - Speed - Frozen Strains - Mold Design - Injection Stamping - Injection Blow Molding - Flow Molding - Reactive Molding.

5.4. Casting : Hollow Molds - Embedding - Dip Molding - Rotational Molding.

5.5. Molding Reinforced Plastics : Hand-Lay-Up Molding - Contact Molding - Spray-Up-Molding - Bag Molding - Filament Winding.

6. Continuous Processing of Molding Materials
 - 6.1. Extrusion : Classification - Single-Screw Extruder - Design and Theory - Twin Screw Extruders - Characteristic Lines - Working Diagrams - Quality Theory - Tube, Sheet, Film, Profile-Extrusion - Coating - Laminating - Blowing - Winding - Internal Stresses - Orientations.
 - 6.2. Calendering
 - 6.3. Drawing
7. Molding Expanded Plastics
8. Fabrication of Semi-Finished Goods
Technical Therms - Machining - Vacuum Forming - Blow Molding - Hot-Forming - Plug and Ring Forming - Friction Welding - Hot-Gas Welding - Heated Tool Welding - HF-Welding - Ultrasonic Welding - Banding.
9. Finishing and Decorating
Printing - Metallizing - Stamping - Embossing - Irradiation.
10. Coating Methods
11. Quality Control
Molecular Tests - Structural Tests - Mechanical, Thermal, Acoustic, Optical, Electrical, Stability Behavior.
12. Fields of Application
Mechanical and Electrical Engineering - Transport - Apparatus Construction - Packaging Industry - Building and Architecture - Medicine - Electronics - Precision Mechanics and Optics - Agriculture - Household and Living - Recreation.

RSA Control Engineering

F.Gregori

1. Control Loop
2. Controlled System : Time-Behaviour - Heating-zone as Controlled System
3. Temperature Measurement
 - 3.1. Resistance Thermometer : Cross-Coil Instrument - Moving Coil Instrument in Bridge Circuit (Deflection Method).
 - 3.2. Thermocouples
4. Controllers
 - 4.1. Continuous Controllers
 - 4.2. Two-Position Controllers : Galvanometric Controller - Chopper bar Controller - Controller with Inductive Pick-Up - Controller with Photoelectric Scanning - Electronic Controllers - Thermocouple as Detecting Element - Resistance Thermometer as Detecting Element.
5. Temperature Control
 - 5.1. Hunting
 - 5.2. Two-Position Control with Feedback : PD-Control Behaviour - Thermal Feedback - Electronic Feedback - PID-Control Behaviour - Thermal Feedback - Electronic Feedback.

AU Compounding

K.Wolanek

1. The Production of PVC-Compounds by Heater-Mixing
2. Testing Methods for PVC-Compounds

EX Extrusion

H.Revesz

1. Production of Sheets
2. Production of Tabular (Blown) Films
3. Hose Extrusion (plasticized PVC)
4. Pipe Production (rigid PVC 75 ϕ x 3,6 mm)
5. Production of Installation Pipes (rigid PVC 18 ϕ x 1 mm)
6. Measuring of Pressure.

HZ Machining and Forming

E.Strohmayer

1. Machining : Cutting - Guillotine shears -
Drilling - Screwing - Turning - Planing - Milling -
Filing - Grinding - Polishing.
2. Welding : Press-Welding - Heat-Impulsive Welding -
High Frequency Welding - Hot-Gas Welding.
3. Forming : Bending - Whirl-Sintering - Vacuum Forming.
4. Workshop-Drawings - Work-Instructions.

OT Finishing

J.Smelik

1. Electroplating
2. Materials
3. Part Design
4. Molding Factors
5. Chemical Pretreatment

PR Compression Molding

J.Lauteren, R.Hillisch

1. Toggle Lever Press
2. Up-Stroke Press
3. 100 ton Laboratory Press
4. 160 ton Down-Stroke Press

PT Testing

W.R.Jessenig, H.J.Fischer, H.Hubeny

Part I

1. Molecular Investigations

Viscometry - Viscosity number - intrinsic viscosity - k-value - Distribution of Molecular Weight - Density and Specific Volume.

2. Structural Investigations

Oscillating twisting test - Thermoplastics - Elastomers - Thermosetting Materials - Glass Temperature - Dynamic Glass Transition Temperature (according to DIN standards) - Melting Temperature - Decomposition Temperature - Melt Viscosity and Flow - Flow - Rheology - Terminology - Definitional Equations - Viscoelastic Behaviour - Measuring of viscosity in the capillary-tube rheometer.

3. Stability Behaviour

Permeation of Gases and Vapors - Mechanism of a Solution Diffusion - Gas Permeability.

4. Mechanical Behaviour

Short-Time Behaviour - Tensile Test - Measuring of Force with the Pendulum Force System - Electronic System for Measuring the Force - Electronic Force Measuring Head (Inductive) - Electric Force Measuring Sockets - Measuring of Elongation with the Mechanical Elongation Measuring - Electronic Elongation Measuring - Evaluation of the Tensile Test - Temperature Dependence - Dependence of characteristic values on strain rate in the Tensile Test - Compression Test - Bending Test - Impact Strength Test - Impact Tensile Test - Hardness Testing - Dropping Tests - Friction and Wear, Burst Test - Internal Pressure Pipe Testing - Fundamental Principles - Wall Thickness Measuring - Conventional System - System DURAPIPE (ANGER) - Specimen End Fittings - Long-Time Behaviour - Creeping Test.

5. Optical Behaviour

Photoelasticity.

6. Thermal Behaviour

Determination of characteristic physical values - Dimensional stability under heat - Dimensional stability under heat according to Martens - Vicat Softening Point VSP - Dimensional Stability under Heat according to ISO - Brittleness Temperature Tests according to DIN and according to ASTM - Shrinkage Behaviour - Proof of Orientation in Molded Parts - Classification of High Polymer Building Materials according to their Combustion Behaviour - General Facts - Execution of Test I - Evaluation - General Facts Test II - Execution of Test II - Evaluation.

7. Heat- and Sound Technology

Thermal Conductivity - Steam Permeability - Thermal Insulation - Step Sound Insulation - Air Sound Insulation - Degree of Acoustic Absorption - Dynamic Elasticity Modulus and Loss Factor.

8. Electrical Properties

Volume- and Surface Resistance - Tracking Resistance - Polarization and Dielectric Constant - The polarization of an insulating material - The dielectric constant is a criterion for the amount of polarization of an insulating material - Dielectric Loss Factor.

Part II

1. Hardness Testing by the Indentation Test
2. Dimensional Stability after Heat Storage (Shrinkage Test)
3. Testing of Homogeneity
4. Testing of Flammability
5. Compression Test
6. Tensile Test

Part III

Ultrasonics in Processing and Testing Materials

1. Ultrasonics in der Processing of Semi-Finished Goods
General Facts - Method - Sound Sources - Ultrasonic Rivetting - Ultrasonic Embedding
2. Testing of Materials by Ultrasonics
Application - Generation of Ultrasonics - Ultrasonic Waves - Ultrasonic Testing Methods - Through Transmission Method - Impulse Reflection Method.

RT Computation Engineering

F.Mayer

1. General Facts
2. Structure of a Computer
3. Programming Operations
4. Connection with an EDV-Plant
5. Computation of a problem in Connecting with Testing of
Plastics Materials
6. Practical execution of a Program at the Computer
7. Other Possibilities of Application in Plastics Engineering

RS Control Techniques

G.Minarovich

Open-Loop-Control

1. Voltage supply
 2. Standardized connection diagrams and symbols
 3. The Use of Instruments for measuring the Current, Voltage,
and Resistance.
 4. Functional Description of a Reversing Contactor Combination
Automatic-Control
-
1. Definitions
 2. Automatic Control System and Block Diagram
 3. Transient Response of a Controlled Member
 4. Temperature Behavior of a Barrel Zone Controlled by
Two-Step Action Controller without Feedback
 5. Temperature Behavior of a Controlling Member with Two-Step
Action Controller and Feedback
 6. Electrical Methods for Measuring the Temperature

SH Molding Expanded Materials

E.Feitzl, E.Hubeny

1. Polyurethanes
2. Foaming Machines
3. Mold Design
4. Mold Materials
5. Test Methods

SP Injection Molding

H. Graf, W.Mazoch

1. Introduction
2. Testing of Influence of Mass Temperature on the Performance Qualities of a Molded Article.
3. Influence of the Mass Temperature and Injection Pressure on Shrinkage and Mechanical Strength of Polystyrene Test Bars.
4. Testing of Performance Properties of Standardized Panels made of Expanded Thermoplastics with a varied Injection Capacity.

VK Molding Reinforced Plastics

H.Hubacek, E.Feitzl

1. Technology
2. Reinforcing Materials
3. Types of Plastics
4. Practical Hints for Processing

SPECIAL ACTIVITIES

Plant visits during the training programme:

KUNDIGRABER, Ebreichsdorf, Window profiles, PVC windows
ANGER PLASTIC CONSULTING, Wien
3 M, Perchtoldsdorf, Tapes, Chemicals, Adhesives.

Supplementary Lectures:

Mr. Bausback, ANGER PLASTIC CONSULTING, Consulting Agreements
Mr. Luksch, ÖSW, Polyethylene, Polypropylene
Mr. Melis, Federal Trade Chamber, Economical Situation in Austria
Mr. Faza, PE-U-TEC, Polyurethane Mixing Machines
Mr. Ganser, PERGA-Plastic, PP-Sheets and Films
Mr. Hubeny, Organization of LKT

Supplementary Papers:

ONORMEN Austrian Standards
E.Schmitz, H.Hubeny, Higher Studies in Plastics Technology
H.Hubeny, E.Herbinger, H.Schermann, Provisional recommendations
for the equipment of a plastic laboratory (1970)
H.Hubeny, H.Graf, K.Wolanek, Provisional recommendation for the
equipment of a technological plastics laboratory
(Compounding, Injection Moulding, 1971)
H.Hubeny, Chemical Blowing Agents
LKT, Lecture Notes in Plastics Technology, 17 volumes, 750 pages.

Social Engagements:

Weekend Trip: Vienna Sight Seeing, Vienna Prater

Weekend Trip: Neusiedlersee
Mörbisch, St. Margarethen
Burgenland

Weekend Trip: Dachstein, Planai
Schladming
Steiermark

Farewell-Party: Heuringenabend
Fire-Camp

E Q U I P M E N T

For the practical training the following machines and apparatus were used among others:

AGM, Allgemeiner Maschinenbau, Linz; Extruders
ALPINE, BRD, Extruders
APM Anger Plasticmaschinen, Wien; Extruders
BATTENFELD, BRD; Extruders, Injection Molding Machines, Blow
Molding Machines
BAUER, Schweiz; Measuring Instruments
BRABENDER, BRD; Plastograf
BRENSON, USA; Ultrasonic Welding
BROSA, BRD; Control Instruments
BRUELL & KOJER, Acoustical Instruments
BUCHER-GUYER, Schweiz; Presses
COUDENHOVE Poly-Spray, Wien; Spray-Up Machines
DEMES, BRD; Pre-Treatment Instruments
ENGEL, Schwertberg; Injection Molding Machines
FRANK, BRD; Testing Equipment
GOERZ Electro, Wien; Instruments
HAGEDORN & BAILLY, BRD; Control Systems
HARTMANN & BRAUN, BRD; Control Systems
HASCO, Wien; Moulds
HENNECKE, BRD; PUR-Foaming Machine
HENSCHEL, BRD; Mixers
HONEYWELL Bull, Wien; Time Sharing
JOENS, BRD; Control Systems
ILLIG, BRD; Vacuum Forming Machines
KRETZ, Graz; Ultrasonic Equipment
KRAUTKRÄMER, BRD; Ultrasonic Equipment
LÖDIGE, BRD; Mixer
MASCHINENBAU- UND VERTRIEBSGESELLSCHAFT, Kottlingbrunn; Injection
Molding Machines
NETSTAL, Schweiz; Injection Molding Machines
PERKIN-Elmer, USA; Analytical Instruments
PE-U-TEC, Wien; PUR-Foaming Machines
PWF, DDR; Presses
STAIGER & MOHILO, BRD; Instruments

STOUGAARD, Dänemark; Instruments

TIEDEMANN, BRD; Optical Instruments

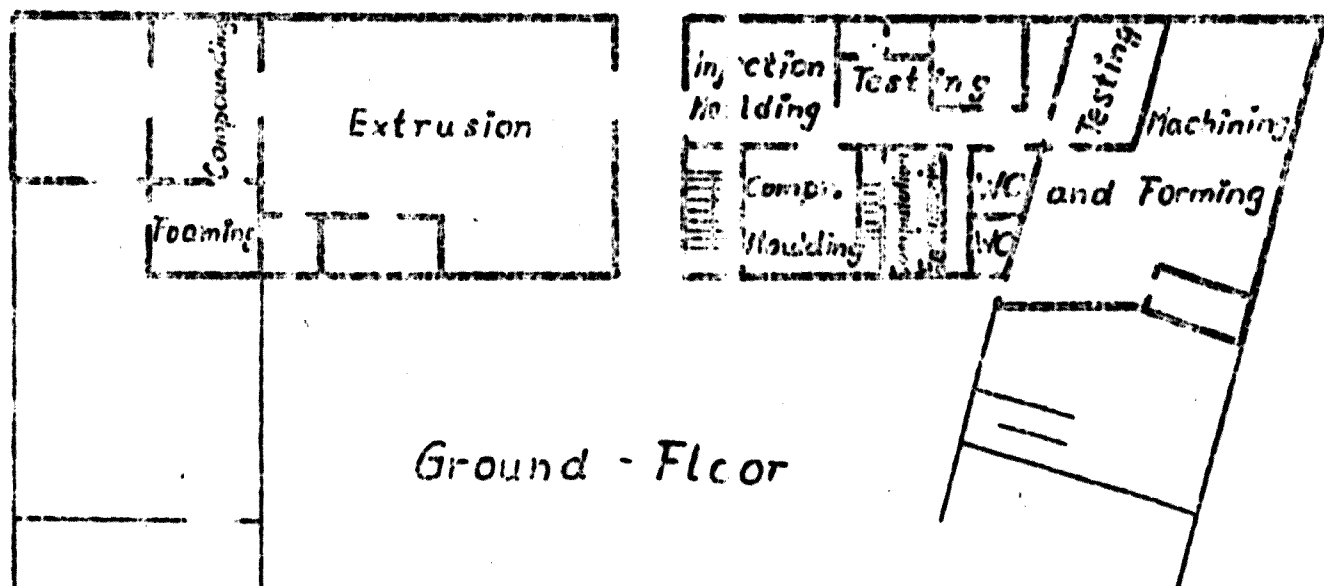
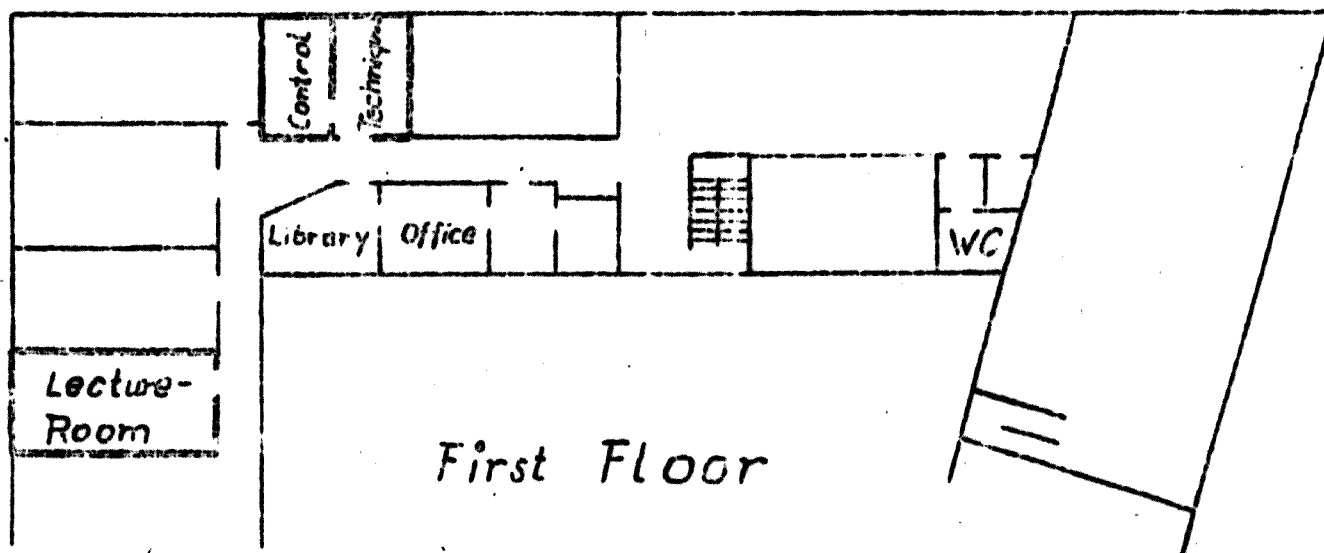
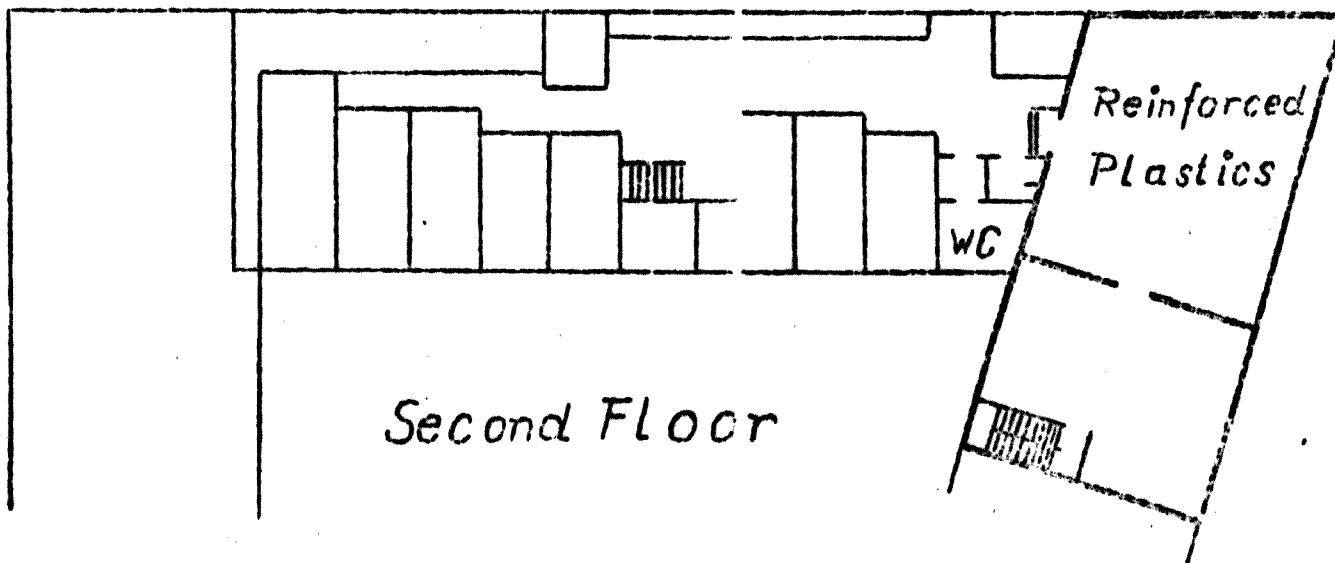
TROESTER, BRD; Calanders, Roll Mills

VEB Werkstoffprüfmaschinen, DDR; Testing Equipment

WITHOF, BRD; Control Systems

ZWICK, BRD; Testing Equipment

BUILDING



Floor Plan

EVALUATION OF THE SEMINAR

The Second Training Programme of the LKT has been evaluated positively by the participants of the training programme above all the excellent human relations, the contents of the Seminar and the machine equipment were specially mentioned.

According to suggestions of participants and our own experiences, we want to present the following re-distribution for all similar training programmes to be carried out at the LKT

	Training Programme		
	1970	1971	Future
<u>Theory:</u>			
CHP Chemistry of High Polymers	0	0	6
CTK Plastics Chemical Technology	8	10	12
MFB Plastics Mechanical Engineering	20	24	24
MTK Plastics Mechanical Technology	20	22	24
PTF Testing	0	0	8
RSA Control Engineering	4	6	8
	<hr/>	<hr/>	<hr/>
	52	62	82
 <u>Practice:</u>			
AU Compounding	4	4	4
BX Extrusion	16	20	20
HZ Machining and Forming	12	12	12
OT Finishing	2	2	8
PR Compression Moulding	6	8	8
PT Testing	8	25	24
RE Computation Engineering	2	2	4
RS Control Techniques	8	8	12
SH Foaming	4	4	4
SP Injection Moulding	16	16	20
VK Moulding Reinforced Plastics	12	12	12
	<hr/>	<hr/>	<hr/>
	90	113	128

With this distribution of lessons it is possible to overcome difficulties that may have occurred during the first and second training programme because of lacking time. Thus the necessary spare time for individual wishes of participants could also be regarded.

The UNIDO in Vienna has the greatest merits in the management of this training programme and so we want to express our gratitude to the UNIDO and all its members who contributed a realization on this project.

We hope that the LKT has contributed with this second training programme wards fulfilling the intentions of the UNIDO to increase the economic development in the developing countries.

We are, of course, prepared to take part in further activities of the UNIDO and in direct cooperation with the participants of the Seminar.

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July 1971/Schmitz, Hubeny

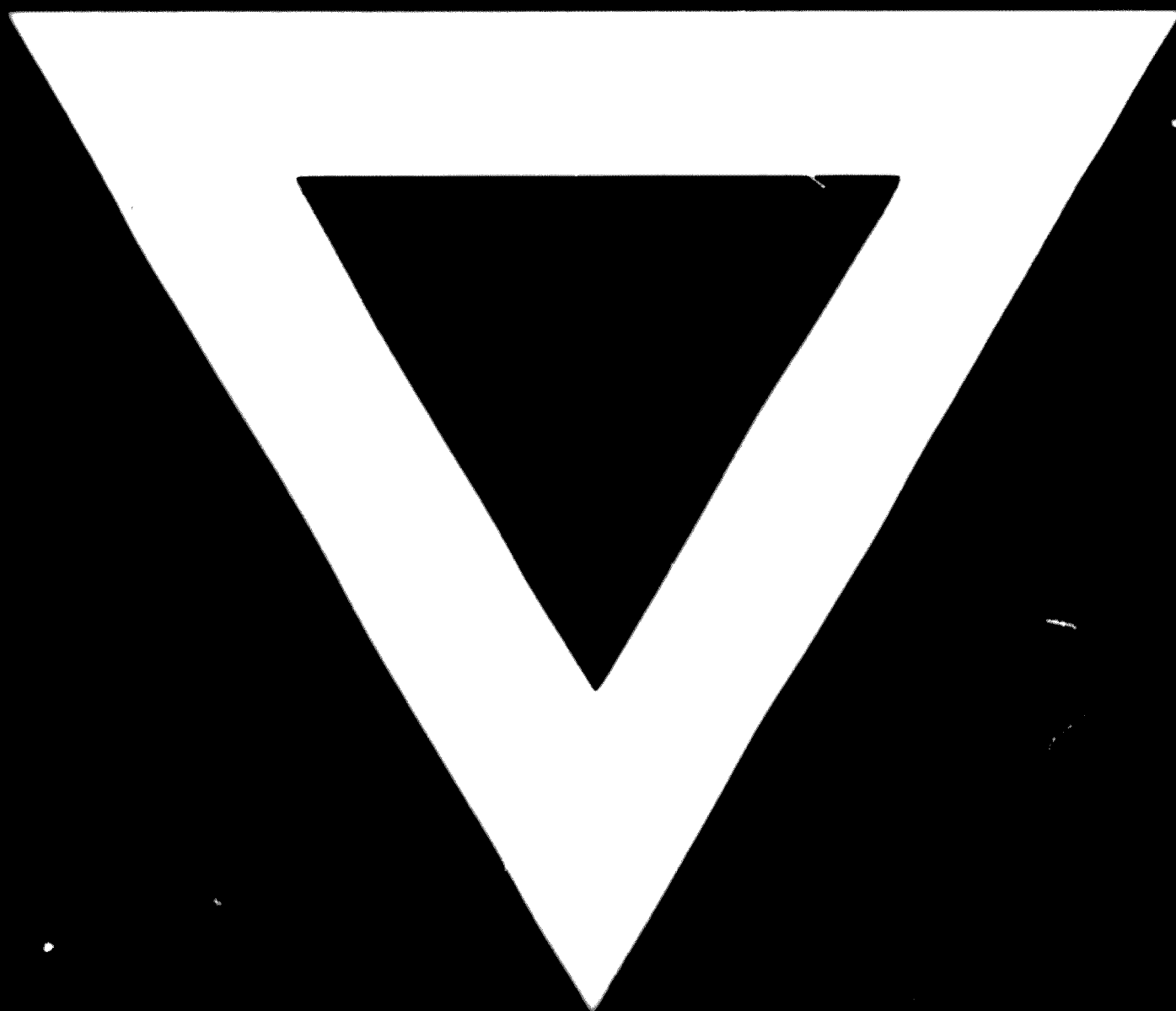


1. The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that this is crucial for ensuring the integrity of the financial statements and for providing a clear audit trail. The text also mentions that this practice helps in identifying any discrepancies or errors early on, which can be corrected before they become more significant.

2. The second part of the document focuses on the role of internal controls in preventing fraud and mismanagement. It highlights that a strong internal control system is essential for protecting the organization's assets and ensuring that all activities are conducted in accordance with established policies and procedures. The text also notes that internal controls help in reducing the risk of errors and improving the overall efficiency of the organization.

3. The third part of the document discusses the importance of regular communication and reporting. It states that management should provide timely and accurate information to the board of directors and other stakeholders. This helps in making informed decisions and in keeping everyone updated on the organization's performance. The text also mentions that regular communication is key to building trust and transparency within the organization.

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