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AGRICULTURE, FORESTRY

CROP PRODUCTION SYSTEMS

ANIMAL KEEPING FARMS

FISHERIES

AFFORESTATIONS

ORKS

AND RURAL HOUSING

ENGINEERING

ATION OF RESOURCES

SUPPLY

TREATMENT

ON CONTROL

ID ACCESS-ROADS

Y LINES AND INSTALLATIONS

'S AND INSTALLATIONS

STEMS

ENGINEERING

GY AND MECHANICAL ENGINEERING

L ENGINEERING AND ELECTRONICS

STRIES

DUSTRIES

ND CONSTRUCTION

ENGLISH
December, 1989

UNIDO/ARCEDEM

Workshop on Core Metallurgical and Other Industries

Project No.
XA/RAF/89/618

FINAL REPORT

Contents

Introduction

As stated in the Lagos Plan of Action and followed by the Programme for the Industrial Development Decade for Africa, the industrialization of Africa requires the creation and maintenence of core industries, e.g. foundry, forging, heat treatment, machine shops, tool rooms, metal coating and surface treatment etc., which is the industrial base aimed at satisfying the basic needs of people. This aim may be achieved i.e. supported by study tours and workshops for development of core industries for African countries.

ARCEDEM (African Regional Centre for Enginnering Design and Manufacturing) had agreed to co-sponsor workshops and study tours on the subject, which were held in Hungary under the organization of TESCO Organization for International Technical and Scientific Co-operation

8 October - 25 October, 1984
30 September - 12 October, 1985
10 October - 31 October, 1986
5 October - 25 October, 1987

The transfer of experience from a country like Hungary, with well established metallurgical and engineering core industries to African participants wishing to promote activities in their industries at national levels was appreciated by all concerned and it was agreed that the workshop and study tour should be held on a repetitive basis to give other participants from African developing countries the opportunity to obtain basic technical information on the establishment and operation of core metallurgical and engineering industries, particularly those supplying necessary tools, agricultural implements and spare parts, to avoid costly and time-consuming imports.
After holding the previous workshops, a number of priority areas for further develoment of ARCEDEM wereidentified and memoranda of co-operation between ARCEDEM and Hungary were signed. During the previous workshops individual discussions with participants concerning specific needs of their countries were held and put on record for follow-up under ongoing or forthcoming projects.
On the basis of UNIDO's Request for Proposal No. P.89/61 TESCO submitted its proposal on July 31st, 1989 which was evaluated positively. The contract was igned on September 28th, 1989.
The objective of the project was the application of acquired knowledge to improve operations of metallurgical units in the home countries of the participants in the workshop. The immediate objective of the two weeks workshop was to provide participants from African developing countries and ARCEDEM staff members with increased knowledge releted to the development and establishment of metallurgical / engineering core industries as a basis for further industrialization, enabling them to identify improvements to be made and future training programmes to be carried out for the benefit of the industrial units (design offices, workshops, foundries) in their home countries, where they are working.
Based on the experience of the previous years, the requrements expressed by ARCEDEM and the goals of UNIDO, TESCO focused the programme on those fields and activities, which most fit to the local possibilities prevailing in African developing countries, i.e. the utilization of locally available raw matwrials and energy resources in order to further develop appropriate technologies on an economical basis.

TESCO will organized lectures on the following subjects:
- forging and heat treatment
- integrated foundry and machine shop
- special foundry technologies
- cold forming and metal fabrication
- handtools production technologies
- agricultural tools, implements and machine production technologies
- modern technologies in ferrous and no-ferrous casting
- application of computers on the controlling systems of machines
- application of computer aided design (CAD)
- organizing systems for technological processes

Detailed previous programme of workshop and study our see at attached Programme Book, edited and controlled by TESCO. The above listed lectures focused on technical aspects of project preparation and plant operation, maintenence and development of the products.
The lectures also covered and discussed the following aspects as well:
- financial evaluation of the operation
- marketing strategy and practice
- market monitoring and surveys
- integration and diversification of production
- international transfer of technology
- financing of investments and plant operation
- financial maneuvers with banking operations
- industrial infrastructure.

Due considerations was given to the views and comments received in the previous workshops and study tours. Active participation of the trainees ensured by giving the opportunuty to present their cases and problems in sessions following each lecture, and through discussions with operational staff duing the plant visits and demonstrations.
The above lectures, plenary and session meetings and discussions were completed by plant visits to factories representing and covering the above listed core metallurgical and engineering industries. The opportunity was provided for consultation with relevant experts and lectures.

Chapter 1

Programme summary of workshop and study tour
9th - 20th October, 1989

9th October, Monday

Official enter lectures of Presidium:

Readers:

Mr A.K. Mitra	- Representative of UNIDO
Mr E. Ivan	- Chairman of the Hungary-UNIDO Comitte
Dr P. Holczer	- Representative of TESCO
Dr Gy. Nanofszky	- Vice-president of Hungarian Ch. of Commerce
Mr S.B. Lwakabamba	- Representative of ARCEDEM

Professional enter lecture:

Reader:
Mr P. Narancsik, M.Sc.Met.Eng, UNIDO expert

Theme of lecture:
- introduction of ceramic moulding process
- brief summary of technology
- planing data of a ceramic moulding foundry
- special machines and equipment for ceramic moulding
- realization of joint ceramic moulding process to an existant foundry

10th October, Tuesday

Lectures: joint lecture of

GENERALIMPEX Hungarian Foreign Trading Company &
GRADIENS Innovation Laboratory

Budapest
Bartók Béla ut 156.
1518

Budapest
Kavics u. 3.
1025

Theme of lecture:
- application of multifactorial measuring system
- multifactorial optimalization of industrial technologies

Activity of company:
The Laboratory has several patents are connected with each other in basic principles, serving the recognition of the human being activity by the environment's transforming in order to find the optimal solution as quick as possible. The system usually was applicated for:
- at the development of spot-welding electrodes, what kind of components, shaping and heat treating can give us a product of good thermal stability, good conductivity and great hardness
- at the development of thin-walled LP-gas cylinder in case of eight technoogical parameters (e.g. hot rolling, cold rolling, hardening, welding etc) and they have carried on research works for the reliable final product having a high tensile strength. Refuse materials reduced from 30-40 to 3 per cent
- under a cultivatig period the profitability of plant cultivation could be increased considerably, meanwhile the environmental problems have moderated also significantly.
- the agricultural process (the optimalization of corn cultivation technology it was mentioned)

Lectures of

IDEX Trading, Engineering and Contacting Company

Budapest
Fő u. 14-18.
1011

Theme of lecture:
- organization of training programme in Hungary and aboard
- video show

Activity of company:
IDEX is one of Hungary's largest and most efficient external trading and contracting companies. Active in the forefront of technological progress, the company carries on a board range of R+D activity extending from the elaboration of concept, followed by planning to implementation. The machines, equipment, instruments and other types of goods it can supply correspond to the world market demands in every respect. The Company is guided by the objective of giving full information to the business community in African developing countries in general, and in particular to pave the way for more thorough acquaintence on either side on the basis of which business relations can be established.

Lectures of

Sewerage Works of Budapest
Budapest
Március 15. tér 3.
1364

Theme of lecture:
- special methods for pipe-laying
- special sludge grabber in a streamlined chain of machines for cleaning sewage conduits
- video show

Activity of Works:
The main profiles of Works are the application, the renewal and utilization of the remaining sewages. On the other hand they were developed some kind of new technology of cleaning for sewage conduit, sewage works with slurry burning system and so on. Because of the sewages consist of many corrosive mixtures, the designers have to anticipate the behaviour of exposed steel-, grey iron-, ceramic and plastic parts and offer the better capabile materials, sometimes acide-resistant high alloyed steel castings for use.

11th October, Wednesday

Lectures of

AGROBER Consulting Engineers and Contractors
in Agriculture and Food Industry
Budapest
Budafoki ut 79.
1117

Theme of lectures:
- export and contract activity of Company
- "How to manage integrated food industrial centre in the developing countries"
- video show

Activity of Company:
- engineering jobs in every branch or sector of agriculture and food industry
- foreign trade sales of different crop production systems, livestock husbandry plants and technologies, including land reclamation and soil improvement as well
- export of complete food industrial processing plants
- technical and economic analyses lying foundation or preparing development projects and investments, elaboration of feasibility studies and the implementation of whole programmes.

AGROBER has reference plant units of four continents of the world.

Lectures of

Production Development Institute of the
University of Agrarian Sciences
Gödöllö
Páter Károly ut 1.
2100

Theme of lectures:
- containers for fruits and fodders
- improvement of yield

Activity of Institute:
The Institute is the main research centre for application new technologies for agrarian industry. One of his most important task to plan and organize technological lines for the improvement of yield and as it is well-known the new technologies need machinery much more than earlier. The utilization is in a close connexion with a possibility of remonting, and the Institute has several plans and offers to remonting the special machinery and equipment.

Lectures of

Research Institute of Electric Industry
Budapest
POB 233
1368

Theme of lectures:
- employment of hydrocarbon fuel burner in the industry and at power stations

Activity of Institute:
- research and employment of electical equipment and machinery
- research, planing and consulting on development of power stations, heating aggregates, heat changers, controlling devices
- development of coal-, oil-, gas-burners and connected devices for industrial warmwater and steamboilers, power stations etc.

Lectures of

AGRIKON Foreign Trade Bureau
Budapest
POB 167
1364

Theme of lectures:
- metal silo plant as the ultimate solution of up-to-date grain storage
- BS-type metal silo bins
- roof structure ventillation
- cleaning system of the metal silo plants
- control the "Nerve Centre" of the metal silo plants

Activity of Bureau:
In the course of almost four decades - AGRIKON, one of the largest Hungarian argicultural machinery manufacturers was founded in 1949 - this company has become a wel-known firm having a high reputation in the field of:
* grain storage
* canning technologies
* tillage tools manufacturing

12th October, Thursday

Lectures of

ÉGSZI-DÉLSZÁM South-Transdanubian Subsidiary Company &
Subsidiary of Institute for Economy and Organization
Pécs
öz u. 5.
7624

Theme of lectures:
- maintenance and management of storage facilities, implementation of computer systems
- presentation of programmes and appliances

Activity of Company:
The Company assists to the customers in solving their organizational and economic tasks and in solving the problems of the practical life.
Some system developed by ÉGSZI-DÉLSZÁM:
- store stack system: a complete system with cash-registers, controlled by an IBM-PC, giving an exact stock-list in any minute and makes everything instead of user
- price calculation system: assisting price calculation on the ÉMIR basis (building industry norm)
- labour economic information system: to assist in the employment and personnel tasks, to substitute the manual work
- chief-account book and current account booking system
- optimalization of the plate (lamina) cutting: it gives an optimal material using-up for geometrical and amorphous figures as well
- way-bill processing
- static calculation
- application of the line-code in the trade

Lectures of:

Building Innovation Bank Ltd.
Budapest
Sziv u.53.
1063

Theme of lectures:
- general introduction about the Hungarian banking system
- importance of building industrial innovation

Activity of Bank:
The Building Innovaton Bank Ltd performs a large number of traditional and non-traditional services of a commercial bank. The principal of their business policy is diversification. They endeavour to have as many business partners as possible but none of the clients or even a small group of clients have determinative importance. The Bank has no intention to specialize in exclusive branches of business, and provides all services needed in the market and corresponding to his possibilities.
The most important business branches of the Bank are:
- leasing
- loan operation

- loans granted for private entrepreneurs
- collection of deposits
- mediation of real estate
- organization of ventures
- current accounts operations

Lectures of

HYDROPLASTIC Ltd.
Nagykanizsa
POB 45
8800

Theme of lectures:
- procedures of water purifying (drink water, waste)
- supplied valves, tanks
- appliances for enviromental protection

Lectures of

Company for Food Machine Industry
Budapest
POB 128
1475

Theme of lectures:
- appliances in milling industry
- shops in developing countries
- video show

Activity of Company:
- flour-milling and fodder mixing industry
- baking industry
- dairy industry
- packaging technology and machines for the food industry
- special machines for the food industry
- mounting and erection of food industry equipment and plants

13th October, Friday

Lectures of

Company for Small-scale Industries
Budapest
Tanács krt. 27.
1052

Theme of lectures:
- organization of handicraftsman in Hungary
- consultation
- visit the workshop

Lectures of

FÜTÖBER Heating Equipment Company
Budapest
POB 128
1475

Theme of lectures:
- production of air conditioning appliances
- organization of production in workshops
- video show

Activity of Company:
FÜTÖBER is a 40 years ago established company for producing heating, ventilating and air-conditioning equipment. The Company has already exported this products to 25 countries of the world, and had very good business relations with several African countries for instance in Algeria, Egypt, Libya, Nigeria, Kenya and Tanzania.
The basis of FÜTÖBER Co. business philosophy is to render his customers complete services including the supply, erection, setting-up and putting into operation of heating, ventilating and air-conditioning systems. In this performance the Company shows three types of centrifugal fans (HLE, HPE and HP) and a central station air-handling (air-conditioning) unit. This time the Company starts the collaboration with Weiss Technik Co. (Austria) on the producing KW type unit, under Weiss licence. This is a most modern techni with wide range of capacity (from 1000 to 50000 m^3/h).

Lectures of

UVATERV Enterprise
Budapest
Vigadó tér 1.
1051

Theme of lectures:
- precision casting method
- shell moulding method in foundries with high accuracy
- video show

Activity of Enterprise:
UVATERV's design activities cover the following fields:
- roads, expressways, urban traffic
- airports, terminals, towers

- underground railroad, tunnels
- highway and railway bridges
- telecommunication facilities, radio and TV broadcasting towers
- railway networks, railway buildings
- buildings
- conveyor facilities, machinery and structure design
- precision-, sand moulding-, shell moulding-, ceramic moulding-foundries, machinery and equipment

16th October, Monday

Visit to

Factory of Aluminium Structures
Hódmezővásárhely
POB 37.
6801

Programme of visitation:
- visit the workshop
- consultation

Activity of Factory:
Planing, manufacture, mounting and erection of different kind of aluminium structure mainly for the housebuilding industry. The Factory manufactures windows, doors, special containers, scaffolding systems for house building, paraboloid antenna (aerial) reflectors for reception of satellite transmission etc.

Lectures of

Hospital Equipment Joint Stock Company
Orosháza
Szt. István u. 106.
5900

Theme of lectures:
- introduction on its activity
- lecture on the therapentical equipment
- consultation

Activity of Company:
This Company is manufactured some type of X-ray and radiation protection equipment, complete units and spare parts too, complementary units, auxillary devices and accessories, equipment for dark rooms and for the handling of findings. Their manufactures go mainly to the Hungarian market, but they also have substantial export sales.
The Company's products are being used in several countries of Europe, Asia and Africa. Company has business contact with Greece, Libya, Cameroun, Nigeria and Yemen.

Lectures of

Láng Engineering Works Affiliated Firm
Dombóvár
Munkás tér 1.
7200

Theme of lectures:
- special welding technologies
- video show
- consultation

Activity of Firm:
This firm produces basic and co plex equipment and apparatuses for many industries, among them main for the chemical, pharmaceutical, canning, milk, meat and sugar ones. One of the main activity fields is to manufacture steam-, and warmwater boilers by own design. There are several places having LÁng-boilers in operation, e.g. industrial

plants, housing estates, district heating centers etc. On the other hand LEW is producing different kind of apparatuses and equipment for the chemical industry e.g. condersers, heat exchangers, evaporators (thickeners), filtering equipment and autoclaves.
Among others the Firm was manufactures equipment for food processing and canning machinery for example equipment for the alcohol distilling industry, maize mills for the starch industry, hot-air fruit dryers, clarifying and storing tanks etc. The Firm undertakes the production of unique, individual equipment, apparatuses, manufacturing and processing lines taking into consideration every wishes and demands of customers.

17th October, Tuesday

Visit to

Ujszeged Weaving Trade Enterprise
Szeged
Alsókikötősor 11.
6726

Programme of visitation:
- introduction of Enterprise (lecture)
- visit the workshop
- consultation

Activity of Enterprise:
The USzW is a technical cloth enterprise. The basic products are the textiles apt to use for various technical purposes and will be utilized almost in all branches of industry. One of the most important field of their activity is processing inlet cloths for conveyer belts, inlets of the V-shaped belts. Other hand they are producing screen-textiles of high strength will be used as edge-cloths in the manufacture of rubber tyres. USzW manufactures big quantities of filter textiles, which will be utilized in the food-, pharmaceutical-, chemical-, and petrochemical industry. In addition to manufacturing textiles the enterprise also makes ready made articles from filter cloths according to the customer's demands and also undertakes development tasks together with the customers. They also developed the manufacture of membrane filter candles for filtering fruit juices and beers. Also the production of nets, made of syntetic basic material without any knots, has also traditions already. Their fields of employment are fishing, gardening, game catching and other industrial purposes. Enterprise extended his activity to renew used textile machines, and this process demands many precision castings with high accuracy and plained surface from different alloyed steels.

Visit to

Hungarian Cable Works
Szeged
Huszár u. 1.
6701

Programme of visitation:
- introduction of Works (lecture)
- visit the workshop
- consultation

Activity of Works:
Producing different kind of cables for the electric industry, machinery, power stations etc.

Lectures of

TUNGSRAM Company Ltd.
Budapest
Váci ut 77.
1340

Theme of lecture:
- introduction of Company
- detailed activity of Company
- possibilities of cooperation with TUNGSRAM Co.
- Company and it's counterparts

Activity of Company:
TUNGSRAM is one of the very first companies in the world who have engaged in manufacturing of electric light sources. The production of light sources has remainded their main activity. Besides of rule production they are interested in the relying on Computer Aided Design optimalizing methods, and Company is contractor for delivery and installation of complete lighting systems (light sources, projectors, luminaries, circuit elements, masts, cables etc.) for all indoor and outdoor applications. Since early periods of its existence, TUNGSRAM has paid attention to the development both of its products and of the relevant processes that has been inseparable from the improvement of the machines and equipments themselves. As a consequence of these efforts, almost all tools and equipment, production lines designed to increase the capacity and to introduce new products and processes, have been built since several decades in TUNGSRAM's own engineering works. The short summary of products is the following: cap filling machines, lamp testing machines, machines for electrostatic bulb coating, lamps ageing complexes, lamp assembling lines with continuous motion, furnaces, batch houses and complementary shops for glass production for vacuum engineering, individual glass processing machines, packing machines - with one word: full services all around the light source processing.

Lectures of

UVATERV Enterprise

Theme of lecture:
- foundry for grinding balls (grey iron foundry) with an out-put of 2000 tons/year

18th October, Wednesday

Visit to

Affiliated Firm of IKARUS Automobile Factory
Szeged
Fonógyár ut 13.
6701

Programme of visitation:
- video show
- visit the workshop
- consultation

Activity of Firm:
Spare parts production to buses and trucks is the main task for Factory. The application of castings is very important detail of the spare parts production and organization of producing. The management's aim is the diversification of outsider producers and that's the case why they are in connection with many foundries and has good overall efficiency. Factory has a special technology for painting the accessorities, but the technology needs well-cleaned and plained surface on castings. The surface cleaning and plaining determinates the possibility of the casting's employ. This problem gives to the foundries the task for developing continuously the castings quality.

Visit to

MICROSYSTEM Datatechnical Cooperation
Budapest
Városmajor u. 74.
1122

Programme of visitation:
- lecture on computer application in the planmaking, introduction computer aided design systems
- lecture on the computer controling possibilities on the technological equipment and technological processing lines
- lecture and introduction to use computers in the practice

Activity of Cooperation:
Developing, design and accomodation of the computer systems for every kind of practical life. Hardware and software design.

19th October, Thursday

Visit to

IKARUS Automobile Factory Central Plant
Budapest
POB 164
1364

Programme of visitation:
- video show
- lecture on the activity of IKARUS Factories
- visit the factory
- consultation

Activity of Factory:
The buses manufactured by IKARUS Factory in several types for various applications. The Factory is in a close connexion with the most famous bus-manufacturers and he has many fruitfull cooperation with them. The partners, as for example VOLVO or SCANIA, are interested in the collaboration of assembly of super luxury buses. IKARUS Factory is one of the bigest employer of precision and sand moulded castings for several accessories of buses.

Visit to

Raw Material Utilization Company of the Budapest Region
Budapest
Gránátos u. 1/3.
1475

Programme of visitation:
- lecture on the handling of wastes materials
- visit waste recycling plant of the Company
- consultation

Activity of Company:
The Company is dealing basically with the collection of secondary raw materials, as well as their partial processing and trade. Beside this basic activity the Company is also developing and trade of technologies, machinery and equipment necessary for waste processing. The waste is collected by the Company organization, at the industrial companies and at the civil population. The Company has several units for processing waste materials:
- iron premises, for selection, cutting and packing of iron waste
- metalurgical plant for selection and pressing of non-ferrous wastes
- glass plant for selection, grinding and classification
- plastic processing plant for selection and extrusion process
- small plants for processing paper, textile, cable, rubber wastes.

20th October, Friday

Visit to

Affiliated Company of Hand-Tool Factory
Szeged
Rigó u. 38.
6724

Programme of visitation:
- video show
- lecture on activity of Factory
- visit the workshop
- consultation

Activity of Factory:
The main profile of Factory is the manufacture hand-tools and other parts for machines with precision casting method. The Factory uses many kind of technologies in the processing and for this case it has a forge and a die-maker shop (to renew used, old dies and produce new ones). The Factory has furnaces for heating process, too. These three main fields of activity e.g. precision casting, die-making and forging made this Factory the real basis of background of agrarian-, food-, machine mounting and other industrial production.

Visit to

Iron and Aluminium Foundry
Szeged
Tolbuchin sgut 65.
6725

Programme of visitation:
- lecture on activity of Foundry
- visit the workshops
- consultation

Activity of Foundry:
This plant is specialized in grey iron and aluminium casting. Basically, it is a jobbing foundry. In iron foundry basically machine moulding is done. Machines of FOROMAT 40 type are applied. Green sand is used for mulding by utilizing bentonite. Sand is processed in a central sand preparatory shop. Sand loading and returning take place on conveyors. Sand is stored in containers above machines. Casted iron is melted in double cold wind cupola furnace, a receiver is used with the cupola. Fluid iron is poured from monorail or crane. Quality of fluid iron is controlled by determination of carbon-equivalent point.
Castings are cleaned on shot-blust machines. After cleaning surface and size control will be done.
Tournover and oscillating shell-moulding machines are applied for core making by utilizing resin coated sand. Shell moulding is also applicable by which increased exactness of dimensions can be achieved.
Typical casting families/groups: electric motor houses
valves and wedge gate valves
handwheels a.c.a
In aluminium foundry manual moulding, gravity and die pressure die casting are applied.
Work site and activity of apprentices was observed.
Foundry of Szeged is prepared to tke part in training of participants

from ARCEDEM countries.
Crucible natural gas heated furnace with pouring system is used for metal melting.
There is also wood and metal mould making division.

Chapter 2

List of participants

	Name	Country
1./	Azigu Alexis	Benin
2./	El-Tahir, El-Badwi	Sudan
3./	Binazon Augustin	Benin
4./	Gaye Salif	Senegal
5./	Kyaruzi Eleizer	Tanzania
6./	Kachusha	Zambia
7./	Mboo, K.W.	Zambia
8./	Kasongo Mulopwe	Zaire
9./	Nalbet Belkcen	Algeria
10./	Ndyabawe, G.W.	Uganda
11./	Nguedijo Emanuel	Cameroon
12./	Onipede Ibikunle	Nigeria
13./	Jolaiya S.O.	Nigeria
14./	Elube A.A.	Nigeria
15./	Ogunmoye E.A.	Nigeria
16./	Abdullah Baki Ahmed	Nigeria
17./	Ballete Sesay	Sierra Leone
18./	Fawzi M. El-Hadi	Libya
19./	Abdalia Ali	Algeria
20./	Saeed Azhaki K.	Sudan
21./	Bazeruke Raphael	Burundi
22./	Djokoto F.K.	Ghana
23./	Dlamini P.M.	Swaziland
24./	Raji Isiaka A.	Nigeria

Chapter 3

List of offered training programmes:

1./ Foundry training programme

2./ Foundry pattern-making training programme

3./ Training programme in steel foundry

4./ Practical training in precision foundry

5./ Practical training in iron foundry

6./ Practical training in steel foundry

7./ Heating technologies training programme

8./ Reparation of agricultural machinery

9./ Practical training in aluminium foundry

10./ Practical training in copper and bronze foundry

11./ Operation and maintenance of melting furnaces in iron and steel foundries training programme

On the following pages are the detailed training programmes with the necessary data as well as:
- the offered number of participants for one study-tour team
- the necessary minimal duration of the training programme
- preliminary training requested and accepted
- theme and accomplishment of training courses/lectures
- detailed training programme and time-table.

Training No. 1

Foundry training program

Number of participants: 10
Duration: 1 month

Workprogramme:
The first week of the programme is dedicated to theoretical training. The participants get close connexion with the technological system of the chosen 3 foundries (iron-, steel-, precision foundries) spending 1 day in each.
After the theoretical programmes for the next 3 weeks (5 days each), visit the factories and the workshops.

Programme of the first week
1. day: General foundry introduction
- the role of castings in the industry and agriculture
- mechanical characteristics of castings
- brief summary of casting technologies

2.day:
- construction of castings, characteristics of materials
- design of castings, rules of design
- mechanical and metallurgical characteristics of grey iron
- mechanical and metallurgical characteristics of casted steel
- scope of application of castings
- special features of the structure of materials in castings
- methods of material testing

3. day:
Introduction of organization and technology of Foundry No.1

4. day:
Introduction of organization and technology of Foundry No.2

5. day:
Introduction of organization and technology of Foundry No.3

Since Saturday is a holiday in Hungary, the sixth day will be taken up by evaluations and consultations.
On Sundays, the participants take part in cultural programmes to get acquainted with the country and its sights.

Second, third and fourth week programme (in three different foundries):
1. day: practical introduction of the foundry
- instuctions for the prevention of accidents in the hot workshops
- general introduction of the factory with the participation of its managers
- visit the foundry and premises of the factory, discussions with the supervisors
- practical training in the workshops starting with the first phase of the technology (design of castings)
- every participants designs a casting and follows up its manufacturing process

2. day: introduction of moulding technologies, moulding practice

- preparation of moulding materials
- preparation of plain and dried shapes
- procedures of core-making

3. day: introduction of melting technologies
   - manual instructions for furnace theory and practice
   - theory and practice of charging calculation
   - basic and auxillary materials in practice
   - slagforming and degassing agents and their efficiency
   - alloying materials and their application

4. day: pouring procedures
   - pouring temperature and its effect on the characteristics of the casting
   - pouring tools
   - pouring practice
   - temperature measuring methods
   - cooling of castings

5. day: fettling of castings
   - introduction of methods for fettling of castings and their relationship to the quality requirements
   - methods for cutting
   - preparation for heat treatment
   - procedures for casting's qualification
   - sorting and analysis of rejects
   - laboratory analysis of materials (chemical, mechanical, metallographical, X-ray)

Training No.2

Foundry pattern-making trainig programme

Number of participan :s: 10
Duration: 1 month

Purpose: introduction of applicated patterns, core-boxes, wax- and metal-dies at foundry technology, the methodology of planing, realization and practice.

Structure of programme:
1st week: theoretical training, lectures, films
2nd, 3d, 4th week: practial training in two differently specialized pattern-maker shops

Detailed workprogramme:
First week
1. day:
- most frequently used moulding technologies and and additionally used pattern making procedures
- role of series in the pattern-making technologies

2. day:
- introduction of raw materials used in pattern making practice (wood, metal, plastic, plastic patterns, core-boxes)

3. day:
- theory and practice of wooden patterns and core-boxes detail design (pattern-making technology)

4. day:
- theory and practice of metal and plastic patterns and core-boxes detail design (pattern-making technology)

5. day:
- theory and practice of wax and metal moulding dies detail design (pattern-making technology)

6. day:
- consultations

Since Saturday is a holyday in Hungary, on the sixth day of the week the participants will have an opportunity to discuss the material of the week and consult.

Second week (preparation of wooden patterns)
1. day:
- instruction for the prevention accidents
- introduction of the pattern-making shop
- basic data of foundry production programme in action, features of "casting's drawings"

2. day:
- storing of raw materials (wooden)
- drying equipment
- materials of wooden patterns and their features
- working and essembling of parts and elements of wooden patterns and core-boxes
- machines and elements for the pattern-making workshops

3. day:

- essembling of elements of wooden patterns and core-boxes
- fixing of the elements
- painting of patterns and core-boxes

4. day:
- test and controll of the patterns and core-boxes set
- methods for repairing damaged patterns
- mounting on moulding plate

5. day:
- preparing of polystyrene patterns
- preparing of elastic patterns

Third week (preparation of metal and plastic patterns)

1. day:
- instruction of prevention accidents
- introduction of workshop
- respects on foundry production programme in accordance with metal patterns

2. day:
- machines and equipment for metal work and their main types
- detail design of metal patterns and core-boxes

3. day:
- construction and assembly of metal elements
- assembly on moulding plate
- construction of feeding systems, dimensioning on the riser, runners and gates

4. day:
- basic raw materials for artificial resin patterns
- theory of detail design on plastic patterns

5. day:
- phases of production for artificial resin patterns sets

Fourth week (wax dies for precision foundry and dies for metal foundry)

1. day:
- constructing principles for die-making
- accuracy requirements for dies
- applied raw materials for wax dies and dies for gravity castings of metal foundries

2. day:
- die-making technologies
- introduction of machinery in tool room
- drawings of dies, documentations for production

3. day:
- simple and complex wax dies
- manually and automatically opened dies
- preparing of channels for wax inject
- theories of construction and assembly of injectors

4. day:
- short introduction of gravity and pressure dies working
- running tests

5. day:
- constructing of feeding systems for metal dies

Training No.3

Training programme in steel foundry

Number of participants: max. 5 members/group
Duration: 2 months
Preliminary training: skilled worker or technician, knowledge of English (French)

Purpose: acquiring and practising practical knowledge in a workshop of a chosen Hungarian steel foundry, without any theoretical lectures, under working conditions

First week:
- instruction for the prevention accidents
- introduction of the foundry, phases of production technology
- comparision of production methods for iron and steel foundry process
- preparation and practice of sand moulds by manual moulding
- preparation and practice of simple, middle line divided moulds
- assembling of moulds

Second week:
- preparation and practice of sand moulds by manual moulding
- preparation and practice of complex and middle line divided moulds
- correction of moulding mistakes, assembly of moulds
- practice on pouring the moulds

Third week:
- procedures of core-making
- practice of manual and simple mechanized core-making
- practice of mechanized core-making

Fourth week:
- complex mould and core-making with practical assistance, pouring the moulds

Fifth week:
- complex mould and core-making with no assistance
- mould making practice for production of high alloyed steel castings
- practice on pouring the moulds

Sixth week:
- practice on moulding machines
- simple moulds preparation on moulding machines

Seventh week:
- prepare and practice of complex moulds

Eighth week:
- analysis of errors and their reasons on the self-made castings
- consultation
- closing of programme

According to the Hungarian standards, the training programme is limited to five work days per week. Saturday and Sunday are holidays when the participants take part in cultural programmes, on sightseeing according to preliminary agreements.

Training No. 4

Practical training in precision foundry

Training programme

Number of participants: max. 5-person teams
Duration: 2 months
Preliminary training: skilled workers or technicians, knowledge of English (French)
Purpose: acquiring and practising practical knowledge and skills in a selected Hungarian precision foundry, without theoretical lectures, under working conditions

1st week:
- instruction for the prevention accidents
- introduction of the foundry, phases of production technology
- practice of wax pattern making

2nd week:
- practice of clustering

3rd week:
- practice of shell making
- practice of storing and dewaxing

4th week:
- practice of embedding and pouring

5th week:
- practice of melting

6th week:
- practice of trimming of castings

7th week:
- practice of finishing of castings

8th week:
- visit two other foundries
- consultations
- closing the programme

According to Hungarian standards, the training programme is limited to five workdays. Saturday and Sunday are holidays when participants take part in cultural programmes or sight-seeing tours according to preliminary agreement.

Training No.5

Practical training in iron foundry

Training programme

Number of participants: max. 5-person team
Duration: 2 months
Preliminary trainig: skilled workers or technicians
knowledge of English (French)
Purpose: acquiring and practising practical knowledge in a selected Hungarian iron foundry, without theoretical lectures, under working conditions.

1st week:
- instructions for the prevention accidents
- inroduction of foundry, phases of production technology
- practice of manual sand-moulding process
- practice of manual sand-moulding process on simple, middle line divided moulds
- assembly of moulds

2nd week:
- practice of manual sand-moulding process
- practice of manual sand-moulding process on complex, midddle line divided moulds
- reparation moulding defects, mould assembling

3rd week:
- core making processes
- practice of manual and simple mechanized core making
- practice of mechanized core making

4th week:
- solution complicated mould and core making exercises with practical assistence, practice of pouring

5th week:
- solution complicated mould and core making exercises alone, practice of pouring

6th week:
- practice of mechanical sand moulding
- simple mould making

7th week:
- practice of complex mould making

8th week:
- survey of casting defects
- consultations
- closing the programme

According to Hungarian standards, the training programme is limited to five workdays. Saturday and Sunday are holidays when participants take part in cultural programmes or sight-seeing tours according to preliminary agreement.

Training No.6

Practical training in steel foundry

Training programme

Number of participants: max. 5-person team
Duration: 2 moths
Preliminary trainig: skilled workers or technicians
knowledge of English (French)
Purpose: acquiring and practising practical knowledge in a selected Hungarian iron foundry, without theoretical lectures, under working conditions.

1st week:
- instructions for the prevention accidents
- inroduction of foundry, phases of production technology
- comparison of iron and steel foundry production processes
- practice of manual sand-moulding process
- practice of manual sand-moulding process on simple, middle line divided moulds
- assembly of moulds

2nd week:
- practice of manual sand-moulding process
- practice of manual sand-moulding process on complex, midddle line divided moulds
- reparation moulding defects, mould assembling
- practice of pouring moulds

3rd week:
- core making processes
- practice of manual and simple mechanized core making
- practice of mechanized core making

4th week:
- solution complicated mould and core making exercises with practical assistence, practice of pouring

5th week:
- solution complicated mould and core making exercises alone, practice of pouring
- practice of mould making for high alloyed steel casting production

6th week:
- practice of mechanical sand moulding
- simple mould making

7th week:
- practice of complex mould making

8th week:
- survey of casting defects
- consultations
- closing the programme

According to Hungarian standards, the training programme is limited to five workdays. Saturday and Sunday are holidays when participants take part in cultural programmes or sight-seeing tours according to preliminary agreement.

Training No.7

Heating technologies

Training programme

Number of participants: 10-person teams
Duration: 2 months
Preliminary training: engineer, knowledge of English (French)
Purpose: theoretical and practical training (postgraduate training) in the field of heat technology.
Theoretical training (postgraduate training) on university level, participants take part in lectures of the Hungarian university faculties.
Practical introduction/training will take place in research institutes and industrial plants.

Topic of theoretical training:
- combustion theory, thermodynamics, theory of heat transfer, theory of instrumental measuring
- measuring the combustion equipment, automatization of combustion equipment
- environmental protection

Topic of practical training:
- instrumental measuring in the field of combustion theory
- practice of theoretical automatics
- practical introduction of combustion equipment in plant

Topic of consultations:
- combustion theoretical calculation
- heat transfer calculation
- combustion measuring calculation

Topic of closing work:
- solution of complete heat technological exercise

Time schedule of the training programme:
1st week:
lectures: combustion theory
thermodynamics
measuring theory
practice: instrumental measuring (comb.theory)

2nd week:
lectures: combustion theory
thermodynamics
measuring theory

practice: measuring in laboratory
consult.: combustion theoretical calculation

3rd week:
lectures: combustion theory
thermodynamics
theory of heat transfer
consult.: combustion theoretical calculation

4th week:
lectures: theory of heat transfer
automatization
practice: plant visit (one day)

5th week:
lectures: automatization
combustor structure and measuring
consult.: combustor measuring

6th week:
lectures: metallurgical process automatization
environmental protection
practice: automatization
plant visit (two days)

7th week:
practice: plant visit (two days)
solution of closing exercise

8th week:
practice: solution of closing exercise
evaluation of closing exercise
Evaulation of the training programme, closing lecture

Topics of lectures and proportion of each special field of the lectures in the frame of this training programme can be modified according to preliminary agreement as to the participants' preliminary education and field of interest. Determination of closing exercise will be made for individuals acccording to their home practice.

According to Hungarian standards, the training programme is limited to five workdays. Saturday and Sunday are holidays when participants take part in cultural programmes or sight-seeing tours according to preliminary agreement. Relaxing programmes can be organized on holidays too.

Training No.8

Reparation of agricultural machinery

Training programme

Number of participants: 10 peons
Duration: 1 month
Purpose: getting acquinted with repairing technologies of agricultural machines, system and means of reparation

Work programme:

1st week:
- Theoretical training. Lectures, film-shows. Introduction technical literature.

2nd, 3rd, 4th week:
- Practical training in three agricultural machinery repairing works differently equipped

Topics:
- acquiring reparation of simple agricultural, mainly field-cultivating machinery in the frame of practical training
- repairing agricultural small machines; handling and repairing manually operated motor machines
- getting acquinted with machines of high capacity and their reparation

Schedule of theoretical training:
1st day:
- Introduction of the programme
- Past of agricultural machinery reparation in Hungary, from small plants to big industrial reparation bases
- Introduction agricultural machinery applicable in Hungary

2nd day:
- Structure of machinery reparation
- Resource demand of machinery reparation
- Importance of systematic machinery reparation

3rd day:
- Modern spare part producing systems
- Importance of machinery reparation of its character, structure and resource demand

4th day:
- Controlling test of agricultural machinery
- Elaboration of statistics on defects

5th day:
- Reparation of machinery parts/components
- Technology of speeding welding
- Bushing/thimbling and bearing
- Test of parts, testing methods

According to Hungarian standards, the training programme is limited to five workdays. Saturday and Sunday are holidays when participants take part in cultural programmes or sight-seeing tours according to preliminary agreement.

Training No.9

Practical training in aluminium foundry

Training programme

Number of participants: max. 5-person teams
Duration: 2 months
Preliminary training: skilled worker or technician
knowledge of English (French)
Purpose: acquiring and practising practical knowledge in two Hungarian aluminium foundries, without theoretical lectures, under working conditions

1st week:
- istructions for the prevention accidents
- introduction of the aluminium foundry and its surroundings
- brief introduction of applicable production technologies

2nd week:
- practice of sand moulding (manual)
- dry and green sand moulding
- simple, middle line divided sand mould making

3rd week:
- complicated mould making
- core application
- forming running and feeding systems

4th week:
- core making process
- practice of manual core making
- practice of mechanical core making

5th week:
- melting equipment for aluminium alloys
- maintenance of crucible furnace
- practising daily maintenance work
- practice of mould casting
- utilization special materials applicable for moltproduction (degassification, inoculation)

6th week:
- gravity die casting
- processing of gravity dies, preparation for casting
- casting practice
- die maintenance practice

7th week:
- pressure aluminium casting
- introduction of casting equipment
- casting exercises
- practising daily maintenance work

8th week:
- production of aluminium castings
- consultations
- closing programme

According to Hungarian standards, the training programme is limited to five workdays. Saturday and Sunday are holidays when participants take part in cultural programmes or sight-seeing tours according to preliminary agreement.

Training No. 10

Practical training in copper and bronze foundry

Training programme

Number of participants: max. 5-person teams
Duration: 2 months
Preliminary training: skilled worker or technician
knowledge of English (French)
Purpose: acquiring and practising practical knowledge in a Hungarian copper-bronze foundry, without theoretical lectures, under working conditions

1st week:
- istructions for the prevention accidents
- introduction of the foundry and factory plant
- applicable production technologies

2nd week:
- practice of sand moulding (manual)
- dry and green sand moulding
- simple, middle line divided sand mould making
- complex mould making, core application

3rd week:
- core making processes
- practice of manual core-making
- practice of mechanical core-making

4th week:
- shell-moulding processing
- shell-core making processes
- practice of shell mould assembling

5th week:
- mould making with moulding materials/mixtures with chemical bond
- moulding 'in core'
- application, practice of core irons and chaplets
- reel making, reel carrying practice
- moulding practice based on loose/shell/solid pattern

6th week:
- melting copper and copper-alloys
- treatment melting equipment
- daily maintenance work on melting equipment
- moulding practice (operation of hand shank)

7th week:
- casting fettling methods
- cutting practice
- welding of casting defects
- casting production

8th week:
- reasons of scrap casting
- gravity die casting
- consultations
- closing programme

According to Hungarian standards, the training programme is limited to five workdays. Saturday and Sunday are holidays when participants take part in cultural programmes or sight-seeing tours according to preliminary agreement.

Training No. 11

Operation and maintenance of melting furnaces in iron and steel founries

Training programme

Number of participants: 10 persons
Duration: 2 months
Preliminary training: engineer or technician
knowledge of English (French)
Purpose: theoretical and practical introduction of operation and maintenance of melting machinery in foundries. Basic metallurgical education focusing on specific aspects of a foundry. Technology of iron and steel melting. Daily and continuous maintenance of melting furnaces. Economical operation of smelting machinery.

Structure of the training programme:

1st week - theoretical training/postgraduate training

1st day:
- technological build-up of iron and steel foundries, introduction of production phases

2nd day:
- melting machinery in iron foundries, their general technological characteristics

3rd day:
- melting machinery in steel foudries, their general technological characteristics

4th day:
- foundry metallurgy

5th day:
- economical operation of melting shops in foundries

2nd week - acquiring practical knowledge in iron foundry

1st day:
- instruction for the prevention accidents
- knowledge of accident's prevention for continuous application
- charge calculation for grey iron melting, preparation of charging schedule
- continuous operation of the cupola furnace in practice

2nd day:
- continuous operation of the cupola furnace in practice
- iron and slag spouting
- daily maintenance work in practice

3rd day:
- continuous operation of the cupola furnace in practice

- simulation of defects and their elimination

4th day:
- operation control of the cupola furnace from the lighting up till discharging

5th day:
- reparation practice of temporary refractory masonry

6th day:
- consultations

3rd week - acquiring practical knowledge in iron foundry

1st day:
- charge calculation of synthetic cast iron for induction furnace
- maintenance of inducton furnace in practice

2nd day:
- melting practice in induction furnace

3rd day:
- continuous operation of induction furnace in practice, simulation of havarias and their elimination

4th day:
- complete reparation of refractory masonry of the induction furnace
- anew putting into operation of the furnace

5th day:
- acquiring of special metallurgical processes

4th week - acquiring practical knowledge in steel foundry

1st day:
- instruction for the prevention accidents
- charge calculation for carbon steel melting in arc furnace
- elaboration of charging schedule

2nd day:
- charging and melting in arc furnace
- operation of arc furnace

3rd day:
- charging, melting, tapping
- daily maintenance work (practice)

4th day:
- melting of low alloyed steel in arc furnace
- rules of alloying

5th day:
- continuous operation of arc furnace
- special slag forming processes
- melting of high alloyed steel

6th day:
- resting day

7th day:
- reparation of refractory masonry of arc furnace
- anew putting into operation of the furnace

5th week - acquiring of practical knowledge in steel foundry

1st day:
- charge calculation for carbon steel remelting in induction furnace
- operation of induction furnace in practice

2nd day:
- charge calculation for low alloyed steel melting in induction furnace
- operation of induction furnace in practice

3rd day:
- charge calculation for high alloyed steel melting
- operation of induction furnace in practice

4th day:
- programmed melting for continuously operating precision foundry

5th day:
- production programming considering operational characteristics of foundry furnaces

6th week - quality control in foundries

1st day:
- analysing charge composition in chemical laboratory
- analysing methods of C, Mn, Si, Cr, Ni

2nd day:
- analysing practice in chemical laboratory

3rd day:
- theory and practice of spectrometric analysis

4th day:
- practice of spectrometric analysis

5th day:
- testing mechanical features
- mycroscopic tests

6th day:
- scrap analysis in melting shops
- consultations

7th week - maintenance of melting furnaces, theory and practice

1st day:
- introduction of the most frequent defects (havarias)
- reveal of hidden defects
- prevention of defects

2nd day:
- regular maintenance of refractory masonry
- selection and realization of refractory masonry for melting furnaces in serial (standardized) foundry
- as above, but in case of altering product composition

3rd day:
- visit refractory (and other heat-resistant material) producing company
- criteries of refractory selection (lecture on site)

4th day:
- facultative programme
  for engineers: The latest refractories and technologies (university lecture)
  for technicians: visit refractory producing company

5th day:
- visit furnace masoning and maintening company

8th week - economical operation of melting machinery

1st day:
- general characteristics of operation
- purchase, storage of raw materials
- purchase, storage of alloying addition

2nd day:
- reasonable/rational elabration of melting programme
- computer aided production controlling systems

3rd day:
- adoption of new technologies in foundries
- processes in precision foundry and relationship between melting shops

4th day:
- facultative programme: visit again the factory considered the most interesting by the participants

5th day:
- consultation
- closing the programme.

According to Hungarian standards, the training programme is limited to five workdays. Saturday and Sunday are holidays when participants take part in cultural programmes or sight-seeing tours according to preliminary agreement.

Fulfillment

The workshop was arranged in the period of 9 - 20th October, 1989, in Szeged (Southern Hungary). The lectures, plant visits and consultations were carried out smoothly and to the satisfaction of the participants which is reflected in the Memorandum of Understanding signed on October 20th, 1989 - attached to this report as Annex 2.
Positive co-operation was rendered from the participants and the representatives of ARCEDEM. Though the arrival and departure of the group was not in accordance with the required timing and caused extra charges for TESCO, the difficulties were overcome finally.

The present report contains the following chapters:

In the attached Annexes:

Acknowledgement is expressed herewith for the collaboration of participant, representatives of ARCEDEM and Mr A. K. Mitra representing UNIDO.

List of the most profitable lectures
on UNIDO/ARCEDEM Workshop and Study-Tour
between 9 - 20th October, 1989

1./ Steel foundry with ceramic moulding and a capacity of 100-200 tons/year depending on the sizes of castings to be produced (e)

2./ Iron/steel foundry of 1000 tons/year capacity for manufacturing high precision castings using the shell-moulding method (e)

3./ Introduction of TUNGSRAM Co. (e)

4./ Introduction of AGRIKON Co. (e)

5./ Brief description of prewiew Mr Michael Tóth's workshop in the scope of Small-scale Industries (e)

6./ Brief summary of lecture of Ujszeged Weaving Trade Enterprise (e)

7./ Foundry for grinding balls with an output of 2000 t/year (e)

8./ Scope of activity of Building Innovation Bank Ltd. (o)

9./ Activity of IDEX Trading, Engineering and Contracting Co. (o)

10./ Agricultural antirandom system which is very effective Multifactorial optimalization of industrial technology (o)

11./ Scope of activity of ÉGSZI-DÉLSZÁM South-Transdanubian Subsidiary Company & Subsidiary of Institute for Economy and Organization (o)

12./ Introduction of activity of Hungarian Busexport Co. (o)

13./ Introduction of activity of Láng Engineering Works (o)

14./ Scope of activity of AGROBER Co. (o)

15./ Introduction of FÜTÖBER Heating Machines Co. (o)

16./ Manufacturing and application of hospital equipment (o)

17./ Scope of activity and different technologies for waste processing (o)

18./ Principal types of equipment for melting ferrous alloys (o)

19./ The design of cast constructions (o)

20./ Dimensioning of foundries, technical calculations (o)

21./ Up-to-date production lines for precision casting (o)

e = edited pages
o = original pages

ÉPÍTŐIPARI INNOVÁCIÓS
BANK RT.

FOREIGN EXCHANGE OPERATIONS

Our Bank, as a commercial bank wish to provide more and more complete services to the clients that is why from January 1st, 1990 we extend our activity to general bank services for foreign exchange. In the frame of this we intend to perform the following activities:

- keeping foreign exchange account for banks
- participation in the settlement of international payments (performance of transfer without bank antecedents, acceptance and issuing guarantees, performing documentary operations)
- keeping foreign exchange account for enterprises
- receiving foreign exchange deposits
- granting foreign exchange credits for inland economic organizations
- participation in establishing joint venture companies, in preparing and arranging special foreign trade transactions
- providing full professional advice and information in connection with foreign economic and foreign trade activities for the clients.

Our clients may rely on our Bank's services in every stage of their business concepts right from their appearence to their realization.

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BUILDING INNOVATION BANK LTD.

Managing Bodies of the Building Innovation Bank Ltd.

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Mr. Tamás VARGA
General manager of the Building Innovation Bank Ltd.

Members:

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Honorary chairman of the Board of Directors of the Building Innovation Bank Ltd.
Director-general of the Institute for Quality Control of Building Affairs

Mr. Ferenc DÉRCZY
General manager
Company for Building and Assembling Chemical Works

Dr. Mónika DUDÁS
Manager
State Insurance Company

Dr. Tamás ERDEI
Managing Director
Hungarian Foreign Trade Bank Ltd.

Mr. Pál FISCHER
General deputy-chairman
National Association of Artisans

Mr. Péter HAVAS
General manager, retired
of the ex State Development Bank

Dr. Zsuzsa IVANYOS
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National Bank of Hungary

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Dr. Géza MUZSAY
Deputy general manager
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Dr. János POTOCZKY
Managing director
National Trade and Credit Bank Ltd.

Mr.Barna TÓTH
Deputy head of division
Ministry of Finance

Board of Supervisors

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Deputy Commander of the National Militia Commandership

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Planning Company for Civil Engineering

Mr. Károly LOVÁSZ
Deputy head of department
National Bank of Hungary

Dr. Rezső PALKOVITS
Vice-president, retired
National Bank of Hungary

Mr.Tibor SIMEK
Managing director
Budapest Bank Ltd.

Mr. Kálmán TÓTH
General manager, retired

State Building Company, No. 22

Mr. Aurél TÖRCSVÁRI
Deputy director-general, retired
Central Physical Research Institute

Our Honoured Clients,

I would like to greet you in the name of the 95 colleagues of the Building Innovation Bank Ltd. on the occasion that you take our informatory in hand and you honour us with your attention.

Our Bank established in 1983 is not only an innovation bank today but also has full authorization for commercial banking and is at your disposal either in Budapest or in its offices in the country, in Szombathely, Pécs, Szeged, Debrecen and Miskolc.

Our bank was established by our shareholders working either in the building industry or in other fields with the aim to provide full and perfect services for you.

I would like to thank you for becoming our client and that you take advantage of our services. I would like to believe that you are fully satisfied with us.

Please do not hesitate to assist with your esteemed advice in our work.

In the name of all the colleagues of our bank you are greeted by

Tamás VARGA
General Manager

The Innovation Fund for Building Industry which is the legal predecessor of the Building Innovation Bank Ltd. was established by the Ministry of Building Industry and Urban-Development as well as by the State Development Bank in 1983.

In the beginning the organization, commencing its activity with modest capital of 300 million forints, operated as a monetary fund financing technical developments with banking procedures.

Beyond the traditional tasks the Innovation Fund for Building Industry commenced new activities in the domestic economy not much later than was established: it undertook to mediate property and leasehold of real estates with economic purposes (premises, industrial plants, business domiciles). It appeared in the market with stop-gap services, enlarged its clientele and obtained supplementary resources

and also favourable publicity possibilities.

During the year of 1985 preparations were made in order that the Fund should be transformed into an Ltd. as a result of which our bank has been operating under the name of Building Innovation Bank Ltd. since January 1st, 1986. The transformation also implied a significant increase in resources, the 24 shareholders - among them the Ministry of Finance on behalf of the Hungarian State - subscribed a total equity capital of 744 million forints. In 1987 the LTD. decided on the increase of the equity capital and issued new shares. At the moment the registered equity capital amounts to 1,160 million forints, the number of shareholders is 61. Two third of the shareholders belong to the building industry, building material industry, resp. planning companies. Several large insurance companies, specialized banks, the National Organization of Artisans, etc. are among the shareholders of our Bank.

With effect from January 1st, 1989 our Bank is authorized to keep bank accounts thus further on we operate as a commercial bank.

Essential Figures of the Annual Balance Sheet in 1988

I. Assets	million forints
1, Cash	282
2, Placing of loans and other assets	918
3, Semi-fixed assets	2
4, Non-paid equity capital	215
5, Other (transitory) assets	20
6, Investments in securities	46
7, Net value of leased fixed assets	417

8, Net value of other fixed assets	49
9, Investments	8
Total	1,957

II. Liabilities

1, Deposits and other liabilities	457
2, Other current liabilities	66
3, Issued bonds	48
4, Registered equity capital	1,160
5, Reserve fund	25
6, Settlement of tax on profits and mid-year utilization of after-tax profits	- 123
7, Profits	324
Total	1,957

Structure of organization

General manager
Deputy general manager
Computer operating department
Secretariate
Legal department
Managing director for financing
Managing director for business
Financial and book-keeping department
Department for maintenance
Financing department
Leasing-financing department
Department for bank accounts
Branch-Office in Miskolc
Branch-Office in Szeged
Regional Office in Budapest
Branch-Office in Szombathely

Sub-Office in Pécs
Sub-Office in debrecen
Banking department
Credit department
Department for ventures
Department for real estate

Members of the Managing boards of Building Innovation Bank Ltd.

Dr. Kálmán FÜREDI
Deputy general manager

Mr. László BONDÁR
Director of the Regional Office in Budapest

Dr. Katalin ROKOLYA-CSÁNYI
Deputy director
Legal representative

Dr. Katalin HORÁNYI-KOVÁCS
Managing director for business

Mr. Tamás VARGA
General manager

Mrs. Maria KOVÁCS
Managing director for financing

Scope of activity

The Building Innovation Bank Ltd. performs a large number of traditional and non-traditional services of a commercial bank. The principal of our business policy is diversification. We endeavour to have as many business partners as possible but none of the clients or even a small group of clients have determinative importance.

Our bank has no intention to specialize in exclusive branches of business, we provide all services needed in the market and corresponding to our possibilities. We participate in ventures in quite a large number at the same time, however, we invest a relatively small amount of capital into each of them.

Bank's profits in the structure of business branches in 1988

32 per cent		leasing
29 per cent		capital allotment
26 per cent		short-term loan
10 per cent	of our profits	medium-term loan
2.5 per cent	derived from	mediation of assets
0.5 per cent		other activities.

Most important business branches

Leasing

Instead of the economic organizations and private entrepreneurs who dispose of limited sources for investment it's our bank who purchases and activates as fixed assets the necessary means of production and then lets them on lease for these organizations.

The company which resorts to leasing is in the position to clear the leasing fee as production costs and upon the expiration of the lease period - generally after 40 months - the fixed assets go over into their proprietorship in zero forint value.

This construction is favourable for the company which resorts to leasing since they can obtain means of production without investment, enlarge the production without increasing

the capital fund and their expenditure appears in equal parts after paying for the first instalment. Our Bank undertakes to let on lease fixed assets even of relatively low value.

The means which are most frequently let on lease are as follows: computers, copying-machines, motor vans, machines used in the building industry and machine-tools.

Lease contracts can be concluded at the Banking department of the Regional Office in Budapest and also at the provincial branch-offices and sub-offices.

The import leasing also belongs to the responsibility of the Banking department.

Structure of the Bank's assets (December 31st, 1988)

Net value of the fixed assets let on lease	22 per cent
Long-term allocations (investment loans, R + D capital allotment)	27 per cent
Short-term loans	22 per cent
Cash	6 per cent
Securities	2 per cent
Other assets	21 per cent

Loan operation

The Bank grants short-term and medium-term loans to the economic organizations, enterprises depending on the current supply and demand of the money market, credit conditions and refinancing possibilities of the National Bank of Hungary under definite conditions. As a cover of the loan the Bank inquires mortgages for tangible real estates (eg. factory buildings, rest houses) productions means, - or stipulates

the assignment of the debtor's outstanding invoices. At the Regional Office in Budapest the operation of short-term loans are effected at the Credit department, and the medium-term loans at the Banking department. The provincial branch offices and sub-offices deal with both business.

Distribution of Partners according to the branches of the national economy

On the basis of short-term loan stock (December 31st, 1988)		On the basis of medium-term loan stock (December 31st, 1988)
28 per cent	Industry	2 per cent
31 per cent	Building industry	43 per cent
4 per cent	Agriculture	1 per cent
2 per cent	Trade	0 per cent
18 per cent	Economic organizations financed by state budget	0 per cent
0 per cent	Transport	2 per cent
17 per cent	Other	52 per cent

Loans granted for private entrepreneurs

In the frame of granting loans our Bank's activities to satisfy the demand for either short-term or medium-term loans of natural persons dealing with economic activities and of legal entities with not more than 60 employees deserve particular attention. Investigation of the creditability of private entrepreneurs is effected according to the general regulations, however, special attention is paid to the assessment of the entrepreneur's personal qualifications and suitability.

In order to enlarge our sources which could be involved in

granting loans we search for the possibility to join programmes such as the III. Industrial Restructuring Programme supported by the World Bank, arising the development of the productive sources of this sector.

Loan operation for private entrepreneurs fall within the task of the provincial branch offices and sub-offices as well as the Credit Department of the Regional Office in Budapest.

Collection of deposits

Our Bank ensures the possibility for economic organizations to deposit their financial resources which are temporarily released. The procedure is as simple as possible.
The required sum is to be transferred to the bank account No. 219-98519 of the Building Innovation Bank Ltd.
and the period of the deposit is to be indicated in the notice. Then we send a confirmation to the client that his sum was credited to the bank account. The minimum period of a deposit is 6 days. The rate of interest depends on the period of the deposit.

It is extremely favourable for our clients that we pay interest upon the deposits with a period of 91-360 days even if they are terminated before the time-limit. In this case the interest is lower by one per cent than the amount otherwise due after the actual period.

The provincial branch-offices and sub-offices as well as the Credit department at the Regional Office in Budapest give information about the current conditions concerning the interest rate.

Structure of the Bank's liabilities (December, 31st, 1988)

59 %	own sources
20 %	deposits of economic organizations

3 % refinancing credit
2 % issued bonds
16 % other sources

The other short-term types of business of our Bank such as:
- factoring
- discounting of bills of exchange
- bank guarantee
- secondary operations with securities mainly on commission basis

belong to the sphere of activity of the Credit department at the Regional Office in Budapest and of the provincial branch offices and sub-offices.

Mediation of real estate

One of our Bank's traditional branch is the mediation of real estates of economic purposes (industrial buildings, premises, office blocks). Upon the request of our principals we register the real estate put on sale and we advertise it through the appropriate mass media.

The characteristics (office, industrial building, holiday resort, etc.) measurements, the infrastructural supply and other particulars necessary to be known about the real estate are stored in computers.

For this service our principals pay 0.5 per cent of the value of the real estate and we charge further 1.5 per cent commission only after a successful deal. We make further arrangements to develop our business, as from the year of 1989 we accept commission even from foreign partners, resp. we don't deal only with the mediation but also the purchase of real estates for resale.

Mediation of real estate is effected by the Department for Real Estate of the Regional Office in Budapest.

Organization of ventures

Our Bank undertakes to organize economic enterprises (share-holding companies, limited liability companies, etc.). This may - upon the principals' request - include the entire procedure from recruiting shareholders to the registration at the Court of Registration or just a part of it.

Irrespective of the person or company who performed the organization our Bank participates in several companies regardless of any professional or sectoral restrictions, exclusively the profitability as criterium is kept in view. Thus the Building Innovation Bank Ltd. disposes of financial interest in other banks and economic companies with building industrial, cultural, servicing, educational and scientific research activities.

Enterprises are organized by the Department for Ventures at the Regional Office in Budapest.

Current accounts operations

The primary aim of the youngest business branch of our Bank is to keep the account of small- and medium-sized enterprises and companies resp. private entrepreneurs. Current accounts operations result in the significant increase of our clientele and at the same time it promotes the development of the other branches as well since the companies usually inquire all banking services from their account-keeping bank.

We charge 2 per thousand after the debit side of the account - but in a yearly period at least 50,000 Ft as commission.

We put at our clients' disposal the printed forms necessary for the performance free of charge. We pay a yearly interest of 6 per cent after the credit balance registered in the account to the holders of the account.

At the moment current accounts operations are effected by the central Book-keeping department and the branch-office in Szeged.

Development of the Bank's equity capital and profits according to the balance sheet in the period of 1985-1988

Equity capital

1985	1986	1987	1988	
744	744	744	1160	(million forints)

Profits

44	165	185	324	(million forints)

Head office

Address:

1063 Budapest, VI. Szív u. 53.

Post address: Budapest 62.
P.O.Box 326
H-1393

Head Office's phone numbers: (36-1) 112-9010
telex number: 22-3743 eib rt h
telefax number: (36-1) 132-0567

Main direct phone numbers:

General Manager: (36-1) 132-7121
Deputy General Manager: (36-1) 111-3290

Managing Director for Business: (36-1) 112-0012
Managing Director for Financing: (36-1) 111-3290

The following departments can be found in the building of the head office:

Regional Office in Budapest:

Direct phone numbers:

Director:	(36-1) 132-0158
General Deputy Director:	(36-1) 132-2939
Deputy Director:	(36-1) 112-7769
Credit Department:	(36-1) 112-7769
Banking Department:	(36-1) 132-2939
Department for Real Estate	(36-1) 112-5051

Address of the Central Financing Division:
105. Budapest, V.,
Steindl I. u.6. 4th Floor

Direct phone numbers:

Financial and Book-Keeping Department:	(36-1) 111-3290
Leasing-Financing Department:	(36-1) 131-3523
Telefax number:	(36-1) 111-3425

The International and Planning Division commences its activities in the Head Office of the Bank from January 1st, 1990.
Direct phone numbers:

Director:	(36-1) 112-7769
Department for International Bank Operations:	(36-1) 132-0158

Provincial Branch-Offices, Sub-Offices

Szombathely,
Savária u. 35. 9700
Telephone: (Telefax:) (36-94) 11-576

Szeged,
Rózsa Ferenc sgt. 16/20. 6726
Telephone: (Telefax:) (36-62) 11-774

Miskolc,
Zsigmondy u. 2. 3527
Telephone: (Telefax:) (36-46) 38-875

Pécs,
Rákóczi út 1. 7621
Telephone: (Telefax): (36-72) 33-476

Debrecen,
Wesselényi u. 6. 4024
Telephone: (Telefax:) (36-52) 13-472

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IDEX

Trading, Engineering and Contracting Company · Hungary

H-1011 Budapest, Fő u. 14-18. Letters: H-1251 Budapest, POB 24.
Telephone: 11-51-190; 11-55-420; 11-59-290
Telex: 22-4541 idex h
Telefax: (00-361) 13-51-393

The Introduction of IDEX

IDEX is guided by the objective of giving full information to the business community in African developing countries in general, and in particular to pave the way for more thorough acquaintence on either side on the basis of which business relations can be established.

IDEX is one of Hungary's largest and most efficient external trading and contracting companies.
Founded almost 40 years ago, it has been present on the world market ever since and built up a network of its own offices, agents and representatives in 33 countries of the five continents.
Active in the forefront of technological progress, the company carries on a broad range of R + D activity extending from the elaboration of concept, followed by planning to implementation. The machines, equipment, instruments and other types of goods it can supply correspond to the world market demands in every respect.

What can offer the IDEX to its partners

1. Trading

The Company has a well-trained and experienced team of economists and financial experts, who can do a good job in both the internal economy and external trade in an effort to make it possible for IDEX to accomplish its tasks to complete satisfaction of its business partners.

In accordance with the demands posed by its partners, IDEX engages in simple deals of exchanging goods and special foreign trade activity, such as counter-trade, barter trade, cooperation on a third market, buy-back and other schemes without any restrictions on the range of goods and lines, nor there is any limitation to the area on which it operates. It follows from the scope of its activity that the Company can be commissioned to handle operations related to one another, perform organizational and other activities. Its organizational work and that performed on commission can encompass foreign investments and financing operations as well.

In the recent years considerable changes have been taken in the business relations between IDEX and its counterparts. It is clearly identifiable trend, that the Company are keen on laying the foundations for economic cooperation on a lasting and long term basis and, while doing so, it is seeking mutually advantageous forms and new markets. The Company is endeavouring to satisfy newly emerging market demands and parallel with the effort, the practice of cooperation is combined with the transfer or acceptance, as the case may be, of advanced technologies.

Quite often, joint ventures are also established in the process.
The concepts of the division of responsibility for rendering cooperation efficient, shouldering risks and making profit are gaining ground in economic relations.

IDEX is also active in the import domain.
The opportunities of importing from the developing countries of Africa are now under study.

2. The Engineering and Contracting Activities

- Building Industry

Complete building material manufacturing plants, lime works, brick factories, ceramic plants, reinforced concrete element factories, steel structure and other building material producing facilities and factories. It can construct and furnish residential building estates, hotels, industrial and special purpose buildings.

- Engineering and Instrument Industry and Electronics

Complete plants and precision foundries for making household devices, manual tools, mechanical, electric and electronic instruments and devices, electric motors and different machines. Besides it can produce material handling equipment and build warehouses, equipment and facilities for oil and gas industry and participate in manufacturing of electronic basic materials.

- Agriculture and Food Industry

Cereal, forage and vegetable growing farms, poultry,

small animal and cattle breading farms, as well as food and fodder making plants. As for the food processing industry, it can build vegetable, fruit and meat processing plants, canning factories and biotechnological plants.

- Education and Training

Secondary technical schools, polytechnics and technical colleges, universities, vocational schools and skilled workers training institutions, as well as special educational establishments. It can also build and furnish complete laboratories to be used by educational, research, industrial and other institutions.

- Miscellaneous Special Projects

Service stations, garages, repair plants and perform a wide variety of services, maintenance and repair. It can also make available property protection devices and equipment besides making special equipment to meet individual demands.

3. The Service Programme

- Elaboration of studies, economy calculations and feasibility studies, drawing up technologies, transfer of technology, know-how.

- Planning, general and special planning, elaboration of implementation plans and manufacturing.

- Delivery of machines, equipment and complete plants. IDEX can perform the deliveries on its own or in cooperation with the client as specified in the relevant deal.

- Construction and mounting either by IDEX doing them on

its own or in cooperation with the client. Management of the building and mounting operation.

- Technological consultancy service for planning, construction, mounting, putting plants into operation and for operating them.

- Commissioning experts and training foreign personnel in Hungary.

- Training in a manufacturing plant during the mounting and installation period and in the course of the manufacturing operation.

- In an effort to meet the clients' demands the Company can offer a very wide variety of flexible cooperation schemes.

IDEX substantially relies on the Hungarian R + D efforts and experience gained in planning, manufacturing, building, mounting and installation. If necessary, it hires foreign experts, universities, research, design and planning institutes, plants, works and other manufacturing establishments.

The IDEX has built up close cooperation with more than 10 national research and development institutes, over 20 planning and design institutions and well over 200 manufacturing, mounting and building companies. IDEX has adequate R + D, planning and implementation experience and potential at its disposal to meet its contractual obligations more than favourably.

4. Cooperation in the Financing

It is fundamental for the establishment of mutually

advantageous commercial and business relations and their development between companies to clarify financial and financing opportunities.

Within the limits of its own potentials the Company can very flexibly adjust itself to the changing conditions of and demands posed by the marketplace in respect of finances and financing matters. Depending upon the essence of the trade deal, business cooperation and venture, IDEX has been adopting the method of using forms of financing corresponding most favourably to international practice and the interests of the business partner.

In addition to deals settled in cash, IDEX grants commercial credit to the buyer under the prevailing market conditions, as a method of financing deliveries.

Hungary is affiliated to both the World Bank and the International Monetary Fund / IMF /, IDEX has at its disposal the opportunity of export financing.

It must be pointed out that, depending upon the request submitted by the cooperating partner, IDEX is prepared to study and discuss export financing opportunities of any kind.

5. Cooperation on a Third Market

In the case of common interest, IDEX can offer a study into the opportunities and conditions of cooperation on a third market to the companies of interested partners. Highly varied forms of this type of cooperation can be developed, depending upon the demands, posed by the markets and the delivery conditions.

The potential business partners are kindly requested to offer information about their business activities and lines and voice their ideas about the elaboration and

subsequent establishment of a framework for the establishment of business relations and the launching of cooperation schemes. IDEX is looking forward to meeting new business partners and believes that it will be able to find reciprocally advantageous solutions and methods as a result of efforts made by both sides.

Budapest, 23rd November, 1989.

Joint lecture of GENERALIMPEX Hungarian Foreign Trading Company & GRADIENS Innovation Laboratory, presented by Mrs. Zsuzsanna Böröcz and Mr. János Sulyok

---

- Agricultural Antirandom System which is very effective /application of multifactorial measuring system in agriculture/

- Multifactorial optimalization of industrial technology

Our company, being one of the first private enterprises in Hungary, since 1981 has been dealing with the development of a patent system and its practical realization.
The inventor, Mr. András TEJFALUSSY has patented several processes and apparatuses belonging to this activity.
These patents are connected with each other in basic principles, serving the recognition of the human being activity by the environment's transforming in order to find the optimal solution as quick as possible.

The patent system is known under the name of Gradiens Test System /GTS/ in the industry and under the name of Antirandom System in the agriculture. It is not only a theoretical method but is a practical one.
We have introduced it by means of some practical examples that to what questions having been put on the GTS method or Antirandom method can answer us quickly and more correctly compared with other methods.

1. At the development of spot-welding electrodes, what kind of components, shaping and heat treating can give us a product of good thermal stability, good conductivity and great hardness.

The above task was solved by means of GTS method within one month instead of one year.

2. At the development of thin-walled LP-gas cylinder in case of eight technological parameters /e.g. hot rolling, cold rolling, hardening, welding, etc./ we have carried on research works for the reliable final product having a high tensile strength.
By means of GTS method and technology control the refuse material has reduced to 3 per cent from 30-40 per cent.

3. Under the given soil and climatic conditions what sort of corn can yield a heavy crop in case of different sowing, chemical processing and plant protecting technologies.
By Antirandom method under a cultivating period the profitability of plant cultivation could be increased considerably, meanwhile the environmental problems have moderated also significantly.

On the basis of above examples, you can see that the GTS or Antirandom method is suitable for solving multifactorial problems at several fields over the world in a unique effective way.

In our lecture we have illustrated the basic principles of this method also by a concrete practical example.

We have demonstrated the dependence of relay-steel's grain--coarsening upon heat treating and cold metal-working, for which we have applied a demonstration pattern plate, too.

By means of GTS method on a pattern plate of rectangular form several technological variations could be performed, by the help of that we could examine exactly the distribution of grains. Every point of the steel plate has corresponded to a variation of heat treating and cold metal-working.

In connection with this, the participants at our lecture have been keenly interested. They have put on several questions concerning the Gradiens heat treating and Gradiens rolling. We have been convinced that the audience had understood that we have made them acquainted with a new, interest and effective method.
After this, we have shown a videofilm about the Gradiens heat treating laboratory in English language.

The Gradiens heat treating laboratory consists of an annealing furnace, in which we can perform the heat treating examination in an inhomogeneous space, where the effects of heat treatment have been changing point by point upon the patterns placed in it.
We have presented that after these heat treating examinations in the laboratory, many thousands of measuring parameters can be tested by the necessary material examinations in the dependence of different technological variations. For analyzing the several correlative data serves a patented, so-called tolerance analyzer with computer. In connection with this, they have put on questions, too. We have told that the analysis can be performed with a pocket-computer and any special preliminary training for computer handling is not necessary.

At the finishing the industrial part of our lecture we handed over to every participant a leaflet in English language about the Gradiens heat treating laboratory /GTS-100/.
We have told that for this laboratory you can place an order and it can be used excellently at solving the temperature treating problems of industrial works and in case of recognizing the temperature effects at the educational establishments.

In our agricultural lecture we have also tried to show the Antirandom method by a concrete example.
The example was mentioned under the item 3., i.e. the optimalization of corn cultivation technology.

During a film projection we have told that on the ploughed field we can produce many thousands of plant parcels, each one of them corresponds to a possible growing, technological position. The efficiency of this method is characterized by the fact that our enterprise has produced much more parcels of this type than all together the consulting and experimental establishments working in Hungary.

At the same time, the plant parcels have been also testing parcels which can be measured by a measuring combine, developed by us and by this help to gather the harvest. Herewith we have told that this method can be adapted to different plants in case of divergent cultivation and technological conditions. We have shown on a diagram computed that many thousands of plant parcels have been such as a live function.
By examining this live function, you can see the optimal plant growing conditions and under the given circumstances the most tolerant growing solutions.

Finally, we have summarized our lecture from the commercial point of view, referring to the wide range of application, the rapidity of this method, efficiency and unique services over the world.

In case of your inquiry, please inform our representative as follows: GENERALIMPEX Hungarian Foreign Trading Company

1113 Budapest
Bartók Béla u. 156.
HUNGARY

Dear Sir,

[illegible] the ÉGSZI-DÉLSZÁM South-Transdanubian Organizer [illegible] Company, the Subsidiary of the Istitute for Economy and Organization, - simply called ÉGSZI- [illegible] of this brief paper.

Within our wide scope of activity [illegible] rity of our tasks by [illegible] the calculati[illegible] our customers in solving their organizational and economic tasks and in solving the problems of the practical life. We carry out the major part of our activity on the basis of external orders, [illegible] accomplishments are developed and financed on our own initiative. During our 30 years' history we extended our profile, staff, resources, and external relations as well.

We would like to offer You some system developed by us.

- Store stock system.

A complete system with cash- registers, controlled by an [illegible]. It gives You an exact stock-list in any minute and makes everything instead of You. According to the modern requirements the system is able to operate with a registration based on the line-code /bar-code/ technique.

- A system assisting the price calculation on the [illegible] basis.

With its help, it's possible to make a computerized prelliminar, calculation [illegible] building industry [illegible].

- Labour Economic Information System

To assist in the employment and personnel tasks, to substitute the manual work.

- Chief account-book and current account booking system.

ÉGSZI DÉLSZÁM
DÉLDUNÁNTÚLI
SZERVEZŐ
LEÁNYVÁLLALAT

PÉCS ÖZ U. 5.
TEL: 72/13 688
TELEX: 12 215

- Optimalization of the plate /leather/ cutting/.

  It gives an optimal material using-up for geometrical and amorphous figures as well.

- Way-bill processing

- Static calculations

- The application of the line-code in the trade.

  Acquisition, receipt of goods, stock management, sale, sale-off.

Our high qualified hardware staff can solve nearly every problem You can have. For example here are some projects:

- Automatic shaker machine for laboratories, with temperature, time and speed controll, with registration of every important events during the shake.

- Automatic gas-mixing system, for filling every kind of source of lights. It's high accuracy can increase the lifetime of the bulbs, neons etc.

- Automatic milk analizer.

  It can alarm during the milking if the milk is infected with mastitis.

Besides they make all of the hardware developement needed for our computer systems:

We hope we could make You wonder for our products.
If You have any question, we shall be at your kind service.
For further information, please contact: ZGSZI-DÉLSZÁM
7624 Pécs, Őz u. 5.
Tel: 36-72 25-500
Telex: 12215

Yours sincerely

HUNGARIAN BUSEXPORT

Resume

The participants of "Africa workshop" seminar visited Ikarus bus factory in Bucapest on the 19th of October.
They were greeted by Mr. György Kovács factory manager, Mr. János Nánli contributor and Mr. Gábor Vajda representative of Hungarian Busexport.
Later on Mr. Zoltán Vadnai, Ikarus sales manager joined the visitors.

The program started with the introduction of the company's history and activity. The briefing was held by Mr. Kovács. He reviewed the business policy, the markets, the production and the technical development of the company.
The participants' questions were mainly related to the financing, local assemblies of the African countries.
The visitors saw a video film entitled "Ikarus in the world".
After this a product show took place. where Ikarus bus types 396 Volvo, 350, 280, 365 and 506 were exhibited. Our walk around the factory started in the press workshop where the died and pressed bus components are produced. We continued with the framing and sheeting facilities. The guests were impressed when they strolled through the BURR painting workshop. The assembly line was the last stop at the serially assembled buses. Finally the guests had a chance to see the super luxury buses built on Volvo and Scania chassis in the Single Bus Body Building factory.
We hope that this visit convinced the participants that Ikarus' technology and products represent the top level in the bus industry.

LÁNG DOMBÓVÁRI GÉPGYÁRTÓ LEÁNYVÁLLALAT BUDAPESTI KIRENDE[illegible]SÉGE

Budapest XIII., Váci út 152–156.
Levélcím: 1393 Bp., Pf. 320.
Telefon: 291-098, 498-140, 496-550
Telex: 22–4566

Számuk:
Előadójuk:

Számunk:
Előadónk:

Tárgy:

Kelt: .....

Dear Customer,

Please take this booklet as a short introduction to our company and its products. This is an introduction indeed, since from January 1, 1988 our plant operates as independent company as Affiliated Firm of LÁNG GÉPGYÁR (Láng Engineering Works) Budapest. Our intent and aim to carry further the old, well-known and well-proven LÁNG-tradition in a modern, flexible way of enterprising widening it with the most up-to-date technique and quick, accurate and high-quality work.

Our firm produces basic and complex equipment and apparatuses for many industries, among them mainly for the chemical, pharmaceutical, canning, milk, meat and sugar ones. The industrial steam- and warm-water boilers of our own design meet even the most severe requirements and have won the fullest satisfaction of our customers. There are several places in the world having LÁNG-boilers in operation, e. g. industrial plants, housing estates, district heating centres etc.

LÁNG DOMBÓVÁRI GÉPGYÁRTÓ LEÁNYVÁLLALAT

7200 Dombóvár, Munkás tér 1. Postafiók: 13
Telefon: (74) 65-644, 65-108 Telex: 13–338

5000 · 8 21109 Pátria Ny. (Dfsz.: 3028)

APPARATUSES AND EQUIPMENTS FOR THE CHEMICAL INDUSTRY

- Condensers

  Tray-type mixing condenseres for condensing 1000 to 60.000 kgs of vapour per hour.

  Tube bank-type surface condensers.

- Heat exchangers

  Tube bank-type heat exchangers with rigid tube walls, floating heads or compensators and bent U-shape tube bundles in all sizes. Tube-in-tube - coil tube constructions in all sizes.

- Evaporators (thickeners)

  With external tube bank boilers up to 30 m^2 heating surfaces in vertical or slanting arrangements. Internal tube bank design assembled with vapour chamber and complete with external or internal down spout up to 1500 m^2 heating surface. Steam jacket-type evaporators (globe vacuums) with or without agitators and coil tubes up to 5 m^3 capacity.

- Filtering equipment

  Vacuum drum filters available in 9 sizes complete with various sludge separating systems and in forelayer design.

- Autoclaves

  Closed, pressurized vessels with or without agitators. (The largest autoclave produced so far had a size of 200 m^3).

FOOD PROCESSING AND CANNING MACHINERY

One of the most significant product groups of os which we want to furtherly develop and menufacture. The LÁNG GÉPGYÁR (Láng Engineering Works) started to produce them as early as in the 1920's.

- Evaporators (thickeners)

  The "heart" ot these equipment is the tube bank-type vacuum evaporator which is suitable to produce first of all tomato juice than grape, apple and other fruit juices, moreover can be used in other fields of the pharmaceutical and chemical industries.

- Equipment for the alcohol distilling industry

  Distilling columns for producing industrial alcohol in stainless steel construction. Complete equipment for producing absolute (pure) alcohol with a 5000-35 000 l/day capacity.

- Other equipment

  Lard presses, settling, clarifying and storing tanks, maize mills for the starch industry, hot-air fruit dryers etc.

BOILERS

Based on the nearly 70 years of manufacturing tradition our company produces low- and medium pressure saturated steam, hot- and warm water boilers assembled with automatic burning equipment suitable for combusting hydrocarbons. All boilers are multidraught with corrugated (FOX-type) flame tubes, boiler drums and great water legs in a horizontal arrangement.

Based upon special request and demands we deliver complete "turn-key" with the equipment and machinery necessary for the complete plant operation and the power transformation, e. g. heat exchangers, power transmission lines etc. In such cases we are ready to execute the whole capital project including the design, delivery, installation and commissioning with trial runs.

The welding profession always played an outstanding role in solving the production tasks ahead of us. With the extensions of teh product range and the increase of the quality demands we need more and more highly qualified welders to fulfil our tasks. In our centre (established years ago and unique in the vicinity) we train apprentices and carry out post-training and qualification of welders and here the Industrial Technological Institute Examining Committee supervises the oral, written and practical examinations of the applicants.

Our firm has a so called "custom-made" production which means that we undertake the production of unique, individual equipment, apparatuses, manufacturing and processing lines taking into consideration every wishes and demands of our customers. Completing the production we undertake the delivery to site, the erection and commissioning of our products, the supply of spare parts and servicing as well.

Please do not hesitate and call upon us with your needs for developing, designing, manufacturing, repairing or refurnishing the machines or equipment you want or you already have.

Offering our technical knowledge and skills and capabilities inherent in our enterprising activites and cooperating relations and the hope of future business for mutual benefits I remain,

Sincerely yours,

LÁNG DOMBÓVÁRI GÉPGYÁRTÓ
LEÁNYVÁLLALAT
BUDAPESTI KIRENDELTSÉGE

István Muri
Head of the Representation
Office

AGROBER - ARCEDEM

Representatives of AGROBER Consulting Engineers and Contractors in Agriculture and Food Industry presented their company in lectures supported by film projections and reviewed its activity during the ARCEDEM Seminar held on 11 October, 1989.

Over the past decade there has been a worldwide need for the dynamic enhancement of food production and an increasing demand for food products, particularly in developing countries. To meet this demand, no country can rely on traditional resources and production factors alone, up-to-date and highly efficient methods and implements should be used in boosting food production. To this end, a most purposeful means is to adopt food industrial production technologies or production systems as they are called by their more practical and convenient name.

AGROINVEST, in charge of independent export-import activities for AGROBER, is concerned with the export of such production systems.

Since 1985 AGROINVEST has been empowered with general foreign trade rights and has been working with fully specialized foreign trade professional staff.

Its scope of activity extends to:

- engineering jobs in every branch or sector of agriculture and food industry,
- foreign trade sales of different crop production systems, livestock husbandry plants and technologies, including land reclamation and soil improvement as well,
- export of complete food industrial processing plants,
- technical and economic analyses lying foundation or preparing development projects and investments, elaboration of feasibility studies and the implementation of whole programmes.

Not only know-how and engineering skills required in investment projects as well as technological equipment, breeding materials and seeds are offered by AGROINVEST to prospective foreign partners, but specialists indispensable in project implementation are also put on disposal to the site and the training of local technical personnel is also undertaken and, if requested, management and start-up assistance as well as operational aid for the ongoing projects are provided too.

AGROBER has reference plant units on four continents of the world. The company's activity is very well illustrated by its investment projects outside Europe such as: bread factory and canning plant in Algeria, pig farm and slaughter house in Nigeria, poultry farm in Ethiopia and poultry processing as well as cold storage units in China.

The rabbit farms and fishery establishments in Egypt are also reference items of great significance.

The planning, designing and construction of ten crop dryers in Iraq constituted also an important task in design and implementation.
The company has its own subsidiary office in Brazil too where its fishery specialists are contracted to multiply and raise local fish species. The results are very good.

The interrelationship between agriculture and food industry was also reviewed in the lecture. Those present there were given a simplified scheme in which they could identify all the major elements of the industry sectors and the system of conditions necessary to the development of various areas.

The interrelationship in its presented form enables one to identify areas requiring supplementary development in case of a major development project, e.g. in dairy and meat industry, and to make it possible to ensure conditions for proper implementation as well, starting from arable land to marketing activity.

The lecture then touched on a special food industrial development which has been worked out mostly for developing countries. In this work AGROBER was motivated by the aim to design a food industrial complex or an integrated food industrial base cheaper, simpler and more economical than any other available so far, where several plant units and food industrial operations are combined in a single overall operation.

In the course of the lecture, a complex unit was presented where a slaughtering operation, fruit juice plant, bakery and dairy plant are envisaged for installation in spatially adjacent and combined design. These plant units are of low capacity and are designed to supply small settlements or population groups.

All the essential advantages of the design concept were reviewed in detail; its advantage appears to be in two points: one is the combined, joint installation, and the other one is the use of identical building structures. The advantages arising from both were reviewed in detail. The design concept was supported by the show of slides.

The representative of AGROBER has suggested that this design could be implemented in the ARCEDEM countries as a "pilot plan" since the plan for the combined plant complex promotes the supply of basic food products and, on the other hand, its implementation is extremely cost-efficient.

The UNO repeats its call for the African development decade and declares an "Agroindustry" year for 1991 in Africa.

The technical staff of AGROBER would like to take part in these programs with their complete expertise, in cooperation with representatives of ARCEDEM countries.

Making use of the know-how and technical knowledge available in Hungary, they wish to contribute to developing and expanding food production on the African continent.

AGROBER Consulting Engineers and Contractors in
Agriculture and Food Industry
1117 Budapest, Budafoki út 79.
Telephone: /36-1/ 162-0640
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Telex: 22 5868 agrop h.

AGROBER

TELEFAX
FŰTŐBER Fax.No.: 1640-287

We welcome you on behalf of FŰTŐBER Company. Our enterprise was established 40 years ago and since that time we have developed to one of the greatest manufacturing company in the field of heating, ventilating and air-conditioning in Hungary and in central Europe.

We have a very wide range of products. Main group of our products is as follows:

- air ducts and fittings,
- air-conditioning units,
- heating/cooling coils,
- water tanks,
- fans,
- boilers,
- chimneys (made of stainless steel),
- kitchen appliances,
- dust filters.

We have already exported our products to 25 countries of the worls, we had business relations with several African countries, for instance in Algeria, Egypt, Libya, Nigeria, Kenya and Tanzania.

The basis of our business philosophy is to render our customers complete services including the supply, erection, setting-up and putting into operation of heating, ventillating and air-conditioning systems.

. / .

On a video film we would like to show you our products and activity and factories located in Csongrád, Bátonyterenye and Budapest.
We have received several African visitors in the frame of organization of UNIDO in our Csongrád factory. For this time we would like to give you some informations about our centrifugal fans and air-conditioning units.

The HLE-type, single inlet centrifugal fans can be used everywhere in ventillating systems. The fan-wheel is fitted with backward inclined blades. A complete family of this type is manufactured in serial production, and we are also ready to meet special requirements.
Fans are suitable to supply air or non-aggressive, non-explosive gases at a temperature of max. 60°C. We manufacture 7 sizes, with a wheel diameter from 300 to 800 mm.
Rotating wheel of the fans is fitted on both sizes with self-adjusting roller bearings inclosed in rubber rings. The fan wheel and the bearings of the HLE-500 and -800 sizes can be made either in normal or in reinforced forms depending on rpm. The fan wheel is made of aluminium or steel.

We have presented you the characteristic curves of the fans. The wheel of the fan working in the shaded area of the diagram can only be made of steel. The fan-house is made of galvanized steel up to a dia of 600 mm. The larger sizes are made of painted steel-sheet.
The HLE type fans are equipped with double ground frame, the rubber vibration isolators are located between the two frames. The frames are fixed during transportation. The HP type centrifugal fans can be used mainly in air-conditioning units. They are applied as individual fans or as parts of the air-conditioning unit, where higher quality is required.

The fans are made in single and double inlet forms in 8 sizes with a wheel dia. from 200 to 1250 mm.

. / .

The single inlet fans are named HPE, while the double inlet types are called HPD. The fan wheel is equipped with airfoil type, backward inclined blades made of painted steel sheet. The special design results in a very good efficiency - over 82% - and therefore noise level is low, making the fans suitable to satisfy the highest quality requirements of the ventillating and air-conditioning systems.

The fan-house is made of galvanized steel up to a dia. of 500 mm. Over this size it is of painted steel sheet. The hub is made of cast aluminium. The rotating wheel is equipped with roller bearings. The fans are belt-driven.

The HP type fans are also made with double ground frames, with rubber vibration isolators between the frames. We can supply the fans with flexible duct connections on both inlet and outlet sides.

We are also manufacturing central station air-handling (air-conditioning) units. This time we want to introduce you our KW type units, made under the licence of the Weiss Technik Co. (Austria).

The units are made in 8 sizes, with extruded aluminium profile frame and with insulated double wall covering panels. Capacity ranges from 1000 to 50000 m^3/h. The KW type is produced for general use, while KWH type is suitable to cover hygienic requirements in hospitals or laboratories. The cross-section of the units is quadratic. The inner parts can be handled through large openings, which is very important at the hygienig types in order to ensure easy cleaning of the inner parts.

The most important characteritics of the KW type air handling units are as follows:

1. firm frame construction. The length of the elements can be varied in 250-mm sizes.

. / .

2. double wall construction is of galvanized steel with poliurathon foam insulation. Its advantages: the inside and outside surfaces can be cleaned easily, the insulating material is well-protected from damages, it has long durability, easy maintenance.

3. unit is sealed with flexible profiles made of rubber. It results in absolute air-tightness both on suction and pressures sides.

4. the inner parts of the unit - except the air washer - can be removed easily through the openings.
   Advantages: Every main part can be repaired, the inside surfaces can be sterilized, which is important at units applied in hospitals.

The air handling units have the following main parts:
- fan section,
- mixing box section,
- air-filter,
- cooling coil,
- heating coil,
- air washer or humidifying section,
- sound alternator,
- heat recovery section.

From the above mentioned sections a very wide variety of air-conditioning units can be built together according to individual requirements. It results not too large serial number in manufaturing. Therefore, we generally use universal machines for the production: shearing, sheet bending, rolling, welding and pressing machines, which are well known in your countries, too.

We think we have very good possibilities for co-operation with your countries:
- common developing manufacturing technology in your countries,
- training of your persons to operate the machines,

- manufacturing in your countries under our licence,
- assembling the units in your countries, and the main parts (fans, coils, dampers) supplied by FŰTŐBER.

Manufacturing and application of hospital equipment

The name of our enterprise is Hospital Equipment Joint Stock Company

Our address is: 5900, Orosháza I. István Király u.
Hungary

Our company was founded in 1958 as part of the X-ray and Hospital Technology Enterprise.
Since the second of January 1989. we are an independent joint stock company.
Our shareholders are Hungarian economic organizations in the first place, but we have share in the possession of an Austrian economic organization as well.
This way of running the firm provides greater opportunities for the creation of flexible business links.
The production scal· of our company is highly specialized.
We demonstrate our products in three main groups.

1., <u>X-ray and radiation protection equipment</u>

The X-ray equipment of the models Modix and Serix are widely used in Hungary and we export a substantial number of them mainly to socialist countries.
Our company is the direct manufacturer of the control board, the generator, the radiation cabin, the lifting bench and diverse accessories for this equipment.
From among the accessories we should mention diverse recording tubes, that make special radiographs also possible.
For the X-ray equipment we apply cameras of the model "Zeiss".
During the process of making radiographs the patient and the medical staff have to be protected from scattered radiation.
For this purpose we manufacture and offer different radiation protection equipment, like protection walls of different types and sizes; protection stands, protection seats, protection aprons and vests and a wide variety of protection blankets for special purposes.

The radiation protection is achieved in the first place by building in lead plate linings and lead ruober, but we apply also zinc plates as protection against scattered radiation.

2., Equipment for dark rooms and for the handling of findings
For the development of radiographs we created a film developping equipment. / For instance plane film developping equipment of the type PE-6; film developping equipment for dental surgeries/
The different lead lined furniture manufactured by our firm; such as film transfer sluices can be counted to the group of dark room equipment.
For the evaluation of the developed X-ray films we manufacture different film inspection devices, that we also have on offer. The individual types of film inspection devices are suitable for evaluation of dental films, roll films and plane films. The plane film viewing devices are generally manufactured of wood in varnished execution, that can be henged on the wall or can be put on a table; the first mentioned types can only be put on a table.
The newest type of the plane film watching device is the built in /the wall/ execution with polished stainless front plate.
It's main advantage is that it can be sterilized and put into an operation room.
The plane film developing devices are manufactured in single-field, three-field and diaphragm executions.

3., <u>Complementary units, auxillary devices and accessories</u>

In this group we can offer different head and shoulder supports, stomach spoons, devices for compressing certain parts of the body for making radiographs /for example ureter compressing device/
The operational canals serve for conducting electric and gas networks in the operation rooms

These canals can be built in the wall so, that the stainless covers are in line with it.
On the cover plates gas and electric connections are mounted according to the customers' wishes.
The /switch/board family for the working site consists of 17 varieties, the extension of which is optional.
It has a multiple use; in the first place this is a built in /the wall/ appliance-system used mainly at the working sites of hospitals and medical institutions.
The boards are suitable for the connection and control of medical and other electric instruments and equipment.
In the special therapeutical rooms of health care institutions an ungrounded network has to be established.
For the power supply of these isolated electro-medical networks we propose our separating transformers in several types.
For the monitoring of the isolation conditions of the separated network the isolation level detector can be applied, which is also made by our company.
The isolation level detector emits sound and light signal as the ground related isolation level of the network drops below 50 kOhm. In order to make this sound signal audible in other rooms too, we manufacture separate soundsignal devices.
Our manufacture goes mainly to the home market, but we also have substantial export sales.
Up to the present day we have performed our export activities with mediation of foreign trade companies, but from 1990 we intend to introduce direct foreign trade links as well.
Our products are being used in several countries of Europe, Asia and Africa. Our greatest customer was the Soviet Union, but we also delivered ourmanufacture to Greece, Libya, Camerown and a few years earlier to Nigeria and Yemen as well.

Our products can be ordered from:
Hospital Equipment Joint Stock Company;
Kórháztechnikai Részvénytársaság
H-5901, Orosháza, P.O. Box: 16.
Telex: 83610
Phone: 68/12-307

Ladies and Gentlemen,

there have been made considerable steps recently in Hungary to restructure society and economy.

The restructuring is not only for Hungary valid but also for other countries.

The new laws and legislation allow market economy and an influx of foreign capital and modern technology freely into the Hungarian economy, offering wide possibilities for joint ventures. This way, a framework for a closer cooperation of foreign and Hungarian companies has been created, leading at the same time to the development of our friendly relations, too.

Together with five other MÉH companies, we are the firm of "Budapest és Vidéke MÉH Nyersanyaghasznosító Vállalat" /in English: Raw Material Utilization Company of the Budapest region/, member of MÉH trust as our representation organ. Our activities include the whole territory of Hungary.

We are dealing basically with the collection of secondary raw materials, as well as their partial processing and trade. Beside this basic activity, we are also dealing with the development and trade of technologies, machinery and equipment necessary for waste processing.

The waste is collected by our company at the industrial companies and at the population. We have many, well organized waste receiving objects. Beyond this, we also developed special collection systems, e.g. mobile reception equipment by means of container systems, etc.

Some important data about collections in 1988 and about trade:

We received and sold:

appr. 200.000 MT of iron waste
" 11.000 MT of non-ferrous metals
" 80.000 MT of paper waste
" 2.000 MT of textile waste
" 5.300 MT of glass waste
" 2.000 MT of plastics waste
" 2.000 MT of rubber waste.

According to the half-yearly indicators, the present year will even be better.

Our company consists of several units, specialized for the processing of different wastes.

Such are e.g.:

- the iron premises, for selection, cutting and packing of iron waste
- metallurgical plant where the selected non-ferrous waste /copper, aluminium, etc./ are pressed into blocks. Our own quality control department, equipped with modern measuring instruments, guarantees the composition of non-ferrous metals and their alloys,
- glass plant where the collected glass waste is selected, ground and classified,
- plastics processing plant where the collected plastic foils are selected and then, after a mechanized processing, extruded in the form of granulates or finished products,
- in our smaller plants, additionally paper, textile materials, cable waste, rubber waste, etc. are partially processed.

For waste processing, we developed different technologies, machines and equipment.

We have some patents in this field.

Here we are mentioning some of them:

- glass waste processing technology and equipment
- rubber waste processing equipment
- cable waste processing machines
- drum pressing equipment
- processing system for the amalgame waste of dentists
- processing system for contaminated plastics waste.

We consider the future of our company with a closer cooperation with other companies. We regard mainly the joint ventures founded with foreign partners as advantageous and useful. The Hungarian taxation law offers high tax exemptions for joint ventures having a necessary extent of foreign participation.

In case of joint ventures, the foreign partner has a full guarantee for his invested capital.

At the same time, the Hungarian companies can utilize the possibilities offered in other countries in the new situation more easily.

We hope this short information will lead to the development of our relations and to the utilization of the possibilities offered.
We are open to any new relations which can be useful and advantageous for both parties.

We remain,

yours faithfully

Budapest és Vidéke MÉH
Nyersanyaghasznosító Vállalat

Professional enter lecture on UNIDO/ARCEDEM Workshop and Study Tour on 9th October, 1989

Steel foundry with ceramic moulding and a capacity of 100-200 tons/year depending on the sizes of castings to be produced

Reader: Mr P. Narancsik, M.Sc.Met.eng.,UNIDO expert and consultant

Introduction

The technology of ceramic moulding is very similar to that of the investment casting. The first development named Shaw process had begun in the 1940-s. Since then more varieties of the process differing from each other only in small details came into being and spread all over the foundry industry. The main difference between the two processes is that instead of the wax pattern enclosed completely with the swift settling ceramic slurry the ceramic moulding process applies traditionally split patterns and the ceramic slurry will be poured onto the surface of the drag and cope pattern. The moulds consist unchanged of drags and copes, and the stripping will be carried out traditionally, the melting out of wax won't occur. Cores will be made by pouring the ceramic slurry into the caves of the traditional core boxes. Patterns and core boxes can be made similary to them of the traditional sand moulding process of wood, metal or plastics.

The ceramic slurry used to the ceramic moulding method is based on a binding fluid of forehydrolysed ethylsilicate and on refractory additions of critical grain size distribution. As refractories mullit, molochite, corundum or zirconsilicate can be taken into consideration. Setting time can be controlled with addition of basic catalysers.

To the ceramic moulds above ceramic cores also sand cores made with different traditional core-making methods can be applied such as sodium-silicate bounded-, shell-, no-bake-, etc cores. Simultaneously the use of cores made by the ceramic method is swiftly spreading in the foundries applying traditional sand-moulding technology especially then, if very smooth and accurate inner surfaces or surface parts are needed.

The application of the ceramic cores is most quickly spreading in the pump indusrty for producing impeller castings. The efficiency of the pumps will increase by leaps and bounds if pump paddles can be made specially shaped with very smooth surface and dimensional accuracy. The increase of the efficiency is very important of the view of expenses. Cores made by the ceramic moulding method are ideally suited to reach an excellent surface smoothness and a high dimensional accuracy.

There are a lot more possibilities for using the ceramic moulding and core making process in the modern foundries. The method ideally presents itself to make the foundry more many-sided and can be regarded as a cheeper variety of the investment casting especially for producing bigger castings the processing of which is impossible by the lost-wax method. The method scarcely has dimensional limits, the weight of the castings produced by the ceramical moulding method often exceeds several tons.

Wide-ranging adoption possibilities are provided by the manufacturing of forging swages, dies for the rubber and plastic materials processing, dies for gravity die foundries and glass factories as well as casting master models and core boxes. The attainable surface quality

and dimensional accuracy is in most cases good enough to omit the machining completely or to reduce the machining allowances to a minimum.

Short technological description of the foundry

The foundry is fit for the processing of 100-200 tons/year, grey-iron; non-alloyed and alloyed steel castings made by the ceramic moulding method depending on their size and weight. In case of processing grey-iron castings only, the equipments for the autogenous cutting and the heat-treatment can be omitted.
To save as much as possible of the expensive ceramic slurry, the castings will be made by the so-called backgroundmoulding method, using the so-called background pattern having by 10-15 mm larger outlines than the real pattern itself. Then the 10-15 mm thick gap between the real pattern and the background mould will be poured out with the ceramic slurry.
Cores will be made by the traditional method. After setting the alcohol will be burnt out of the moulds and cores, then they will be heated, cooled and thereafter assembled and poured.
The shake-out, fettling and heat treating operations are the sames as that of the traditional casting production.

. Melting plant

The melting plant consists of 1 piece of 100 kgs and 1 piece of 250 kgs medium frequency, coreless induction furnaces (1,2) together with the belonging electrical equipments (3-6) and water-cooling system (7-11).
The charges will be prepared and measured at the charging area (12-16), and delivered to the furnaces by handwheelbarrows (17), then charged into the furnaces by hand.
The molten and properly overheated metal will be tapped into the pouring ladles (90-91) by tilting the furnaces. There is a drying and preheating equipment (18) for the ladles available.

Background moulding

The waterglass containing moulding mix will be prepared in an 'S' blade sand-mixer (42) and its ancillary equipments (40-43). The empty flasks are stored on a roller-bed (36). The background drags and copes will be made on a pair of vibrations moulding-table (37) by hand and hardened with carbon-dioxide gas which will be provided for by the CO_2 metering apparatus (44). The ready drags and copes will be stored on roller beds (35). The lifting operations will be carried out by the mobile crane (19).

Preparing of the ceramic slurry

At first the liquid binder will be mixed with the universal mixer (47). The ingredients are stored on barrel slids (48) on the rack and working table (50-51). Then the ceramic slurry will be prepared with the slurry mixer (52) from the liquid binder, the refractory grains and the catalyst, stored in steel boxes (55,56).

Core-making

Ceramic cores will be made traditionally on the rotary table (45). The

core boxes will be stored on their rack (46), the ready cores on core storing tables (28), which will be delivered by fork-lift-truck (57) to the place of assembly.

Ceramic moulding

The background dags and copes will be put on the patterns plates and the 10-15 mm thick gap between the patterns and the background moulds will be filled in with ceramic slurry on the rolling tracks (32). The moving of them between the two rolling tracks will be carried out with two roller carriages (33,34), the lifting operations with the mobile crane. After setting of the ceramic slurry the alcohole content will be burnt out from the drages and copes on the rolling tracks(29).

Heating of the ceramic moulds and cores

The moulds will be put on the platform of the kiln carriages (22) with the mobile crane, the cores by crane. The loaded carriages will be delivered into the kiln (21) by the carriage-mover equipment (23). After the annealing the loaded carriage will be drowned out of the kiln and delivered under the cooling covering (24). After cooling the drags, copes and cores will be removed from the carriage and assembled on the assembly rolling bed (29).

Pouring

The pouring will be carried out with the mobile crane. After the solidification and cooling of the castings the castings containing moulds will be put on the platform of the transporting carriages (58) and delivered to the shake-out eqipment.

The shake-out operation

It will be happen on the shake-out equipment (62). The shaked out moulding mix gets into a steel box placed under the shake-out equipment. Later the full box will be lifted out of the pit (63) with the mobile crane (20) and removed from the foundry with the fork-lift-truck (57). Castings will be collected in steel boxes (55). The empty flasks get on the platform of the transport-carriages (60) and by them back into the moulding workshop where the crane (19) will deliver them to the flask-storing roller bed (36).

Fettling

Fettling consists of several operations.
The castings get at first into the wet shot-blasting machine (64) for the removal of the moulding-mix rests from the casting surfaces, after it to the autogenous cutting place where the running and feeding systems will be cut down from the castings with the 'Linde' or with the simple autogenous cutting apparatus (65-69).
Then the castings will be trimmed on the working bench (70). The casting defects will be mended by welding in the welding bay (71).
After it the castings will be grinded with the grinder (77).

Heat-treatment

Steel castings are to be heat treated. A heat-treating oven furnished

with a carriage (78,79), water and oil hardening equipments are available for the purpose.

Dust and fume exhausting and arresting

The air exhausted from the dusty and gassy working places by the exhaustor (87) and its pipe system (85) will be cleaned with a wet arrestor (86).

Lecture on UNIDO/ARCEDEM Workshop and Study Tour
on 13th October, 1989

This lecture has been performed by UVATERV Enterprise Precision Foundry Section and supervisored by Mr P. Narancsik section manager.

Gentlemen!
The title of UVATERV Enterprise's lecture is the following:

IRON/STEEL FOUNDRY OF 1000 TONS/YEAR CAPACITY FOR MANUFACTURING HIGH PRECISION CASTINGS USING THE SHELL-MOULDING METHOD

INTRODUCTION

The offered foundry is to be established beside an operating iron or steel foundry with the purpose to make the existing foundry using now traditional sand moulding technology suitable for enlarging its production range with such castings of high accuracy and very fine surface quality that cannot be manufactured with the traditional methods. The proposed technology not only assures the very high dimensional accuracy and the excellent surface quality but also makes possible the reduction of the machining allowances of the castings on the average by about 50 % and in a lot of cases the total omission of them, and so it results a remarcable reduction of molten metal consumption and machining work.
Establishing the foundry using the shell-moulding method beside an existing traditional one as the additional part of it, has the following adventures:

- It is not necessary to build a separate, new melting plant for the high precision foundry because the molten metal needed to the pouring of the shell moulds can be got by the utilization of the free capacity of the existing melting plant of the traditional foundry, possibly with increasing the number of shifts if it is needed.
- In case of sitting the shell-moulding foundry beside a steel foundry, the heat-treatment of the shell-moulded castings can also be carried out using the heat treating equipment of the existing foundry.
- It is not necessary to build any sand plant for the proposed foundry because the resin-precoated sand will be delivered ready in paper sacks by specialized firms.
  This also means, that in case of existence of satisfactory melting plant, both iron and steel castings can be produced because no different kinds of moulding sands are needed.
- There is no need to build a new, separate fettling shop, because the much smaller fettling work of the shell-moulded castings related to that of the traditional moulded ones can also be carried out in the fettling shop of the existing foundry, possibly with increasing the number of shifts, if necessary.
- The auxiliary plants: maintenance shop, laboratory, pattern making and repairing shop, the production preparing technical-technological and administrative departments etc. as well as the infrastructural establishments already exist and are suitable to provide for the shell-moulding foundry too, with some increase of the manning and

personnel if necessary.
- Generally there is no need to build new social establishments: dressing rooms, bathing accomodations etc., at the worst some enlargement of them could be necessary.
- The sand moulds made in the existing foundry can be combined with shell cores, and so at the very critical internal areas of the castings a very accurate and smooth surface can be produced. Expediently shell cores can be used for forming hardly accessible inner cavities, where traditional sand cores are difficult or impossible to remove entirely from. The excellent friability of shell cores assures the easy and complete removal of the burnt out shell cores from such places.
- Combined: shell mould-green sand can be applied to manufacture small castings if very high dimensional accuracy and excellent smooth surface quality is required. In such cases a box-like shell mould will be made covering the outer surface of the casting or only one part of it, into which shell cores can be put too, and a green sand mould will be made containing the cavities for the shell boxes and the running and feeding system as well. In this way the casting or its critical part will be cast in shell mould, but the running and feeding system in green sand mould, so considerable amount of resin coated sand can be spared.
- It will be possible using traditionally made sand cores or other mould elements for example pouring basins made of sodium silicate bounded sand to shell moulds and sparing also this way some amount of resin coated sand.

The production of the following types of castings with very high dimensional accuracy and excellent surface quality can be suggested in the proposed foundry:
- parts of agricultural machines,
- parts of mining machines,
- abrasive parts of excavators, scrapers, bulldozers etc.,
- abrasive parts of shot-blasting machines,
- crank cases and cylinder-heads of small petrol-, and diesel engines,
- pump parts: impellers, casings, covers etc.,
- cylinders and other parts of small compressors,
- hydraulics castings, etc.

SHORT DESCRIPTION OF THE TECHNOLOGY

Shell-moulding is based on the special properties of its binder the phenol-formaldehyde-novolac resin. It is characteristic of novolac that in cold state it is firm, melts above 75°C and cooled down after solidifies again. To its hardening in hot state such catalyst is necessary which on effect of heat gives some amount of formaldehyde down. Hexamethylene-tetramene is such catalyst because it dissolves to ammonia and formaldehyde at the temperature of 117°C. Formaldehyde makes novolac harden on effect of heat.
Novolac containing this catalyst goes the following changes of state through:
- In cold state it is firm.
- On effect of heat it melts.
- On effect of more heat it hardens.

Shell mould develops in the liquid phase of the resin. This liquid

phase lasts from the melting to the end of the hardening, during which time bond-bridges come into being between the single grains of sand. During this liquid phase a moderate condensing and sinking of the grains of sand bound together by the bond-bridges occur. In the liquid state of the resin the shell mould is fit to compression and so moulds of high strength and excellent surface smoothness can be made.

The basic material of shell-moulding is the resin precoated sand which in the simplest case consists of silica sand, novolac resin applied on the surface of the grains of sand and of the hexa-methylene-tetramene necessary to the hardening of resin in hot state. To improve the technological properties of the sand, it also contains some of the so called additions, first of all calcium-stearate to hinder the adhesion but sometimes also other ones too, such as red iron-oxide, silicate of zirconium, carborundum etc.

Resin precoated sand will be produced with proper coating technology in special equipment serving direct for this purpose. Foundries, almost without exception, buy resin precoated sand ready made, packed into paper bags.

Using the shell-moulding technology shell moulds and cores with a wall thickness of 5-20 mm-s will be produced of resin precoated sand instead of the usual compact sand moulds and cores.

Shell moulds and cores are made in the following way. The surface of the pattern plate or core box preheated to theÚ temperature of 200-400°C and handled with parting medium will be sprinkled, blown or shot with resin precoated sand, this sand layer will be compacted and left on the surface of the hot tools for about 10-40 seconds. During this time the sand will grow so hot that the resin will melt in a certain layer and it will stick the grains of sands to each other and to the surface of the pattern plate or core box. After the development of shell sticked together by the resin thick enough, the surplus sand will be removed. The wall thickness of the shell depends on the temperature of the pattern plate or core box and of the duration of the staying of sand on or in the hot tools.

After the development of the shell it will be heated on together with the pattern plate or core box with a separate heating device or in a kiln to the temperature of 300-500°C and it will be held there until the end of the hardening process and a shell massive enough will be got. The necessary duration of the heating can be determined in the practice of the colour of the shell.

The ready baked shell mould or core will be removed from the tool and cooled down placed on a flatting-board.

Because of the necessity of the heating the patterns and core boxes only metal, first of all cast-iron, in some cases aluminium pattern equipments must be used for the shell-moulding or core making purposes.

To bring the resin preheated sand on the surface of the pattern plate or into the cavity of the core box more methods can be applied, and according to these methods different kinds of shell-moulding and/or core making machines have been developed in the practice.

Using **THE TIPPING PAN SHELL-MOULDING METHOD** the pattern plate preheated to the temperature of 200°C will be joined to the top of the tipping pan filled with resin precoated sand, and the pan together with the pattern plate tipped by 180°. This way the sand falls down to the hot surface of the pattern plate. After the space of time needed to the formation of a thick enough shell (about 20 seconds), the pan will be tipped back to its original position so, that the superfloues, yet dry sand will fall back into the pan. Then the pattern plate together with the shell will be lifted down from the top of the pan and put below a

heated hood or into a kiln for heating on until the end of the complete hardening.
The ready shell mould will be separated from the pattern plate with the help of lifting pins.
When working with **THE OUTLINE-PLATE SHELL-MOULDING METHOD** in addition to the pattern plate one counter pattern plate, the so called outline-plate, which corresponds to the profile of the pattern plate, will be placed in a definite distance from the original one, and the pre-determined interspace will be filled in with the help of pressure with resin precoated sand. The shell mould will be baked between the two hot pattern plates.
The **DOUBLE-PROFILE SHELL-MOULDING METHOD** is a variety of the outline-plate method, where instead of the outline-plate a second pattern plate will be employed. The shell mould elements made in this way can be put one on top of the other and stack moulds produced from them with a common gating system.
At **THE STACK SHELL-MOULDING BY HAND** a frame will be put on the hot pattern plate, resin coated sand will be filled in, the superflous sand pulled off the top of the frame and the shell mould baked in a hot kiln.
When **MAKING HOLLOW SHELL CORES BY HAND** the core box preheated to the temperature of 240-260°C will be filled in from aboveÚ with resin precoated sand. After reaching the necessary shell wall thickness, the core box will be turned by 180° and so the superflous sand removed. Then the core together with the core box will be put and baked in a kiln. At the end the ready core will be romeved from the box.
In case of **MECHANIZED CORE MAKING** the core box will continuously be heated, and the resin precoated sand introduced from above or from below into the cavity of the hot core box by pressure, blowing or shooting. If hollow cores have to be made and the filling in of the sand happened from above, a turning over of the core box will be necessary for removing the superfloues sand. In case of filling in from below, the pressure can be stopped after the necessary shell wall thickness had been reached, and the sand surplu. vill fall back into the container of the machine, without any turnin, over.
The **CENTRIFUGAL CORE MAKING METHOD** is apt in the first place for the production of pump-impeller cores. The 260-280°C hotÚ core box will be placed into the middle of the centrifugal core making machine, fastened, rotated and during the rotation resin precoated sand will be filled in through a funnel place the middle of the core box. On effect of the centrifugal force the resin coated sand will excellently fill up the cavities of the core box. If the cores are thin (8-10 mm) the complete hardening process could occur within the core box. Thick cores have to be heat treated in a kiln.
The assembling of the shell moulds consists of the putting in the cores, placing the cope on the drag and in some parts of cases the adjusting of the pouring basin. The fastening together of the half moulds occurs by sticking, clamping or screwing.
The shell moulds shrink during their cooling. To avoid the buckling and deformation resulted of the shrinkage, it is best to stick the shell mould parts together in their hot condition. An other solution is cooling down the shell moulds put them on the surface of a flatting board and weighted them, and after cooling sticking or fastening them together. In the most cases the pouring basins produced separately will also be fastened on the shell moulds by sticking.
The shell moulds can be poured in vertical or in horizontal position. Small castings with thin walls can be poured of cast iron in vertical

position without any supporting. If the capability of resistance of the shell moulds is smaller than their bearing force supporting with stiffening ribs or with gravel-bed can be necessary. In this latter case the shell moulds will be put into steel-plate boxes and surrounded with gravel.
In case of horizontal casting the shell moulds will be put on a gravel-bed and their copes weighted.
After casting and solidifying of the metal the resin coated sand loses its strenght, the bulk of the resin burns out of the sand and the mould practically collapses. The rests of sand are easy to be removed from the surface and cavities of the casting by knocking and shaking.
After the shake-out operation the cleaning and fettling of the shell-moulded castings can be carried out with much more smaller work in comparison of that of the castings produced traditionally.

TECHNICAL DESCRIPTION OF THE FOUNDRY

The production of shell moulds and cores happens in a workshop with a groundspace of 12x25 m-s. The shell-moulding and/or core making machines as well as the shell-baking kilns are placed parallel with the longitudinal axis of the workshop in three lines. Between the two main lines almost in the longitudinal axis of the shop a slowly moving, 800 mm wide belt conveyor /10/ is placed, which delivers the already cooled down and flattened shell moulds or the shell cores to the storing stands /16/. For making the traditional, one profiled shell moulds, two pairs of twin, hand operated, tipping pan type shell-moulding machines /1/ are available, each of them fit to operate with two pieces of pattern plates simultaneously. The possible biggest dimensions of the pattern plates can be as big as 350x400 mm-s each. Near the machines there are 8 pieces of flatting boards /4/ upon which the shell moulds will be cooled down and flattened. A shellbaking kiln /5/ can be found in the same line with two workbenches /6/ at each end of it. One flatting board/core storing table /7/ belongs to each work-bench. For the storing of the resin coated sand steel-plate containers /9/ are placed in the line, and above the line there is a monorail conveyor /14/ for filling in the sand pans of the machines and workbenches.
At the other side of the belt conveyor three pieces of shell blowing machines are available, apt to make double-profiled shell moulds or shell cores with them. On two of them /2/ pattern plates or core boxes with the maximal dimensions of 460x750 mm-s, on one of them /3/ with 600x850 mm-s can be applied. To all the three machines two flatting boards /8/ belong each. Also sand containers /9/ are there in the line and another monorail conveyor /14/ above the line with the same purpose.
Along of both longitudinal walls of the workshop there are more sand containers /9/ and storing stands /15/ for the patterns, pattern plates and core boxes. Along the left side wall of the shop one more shell-backing kiln /5/ and at its both ends work-benches /6/ and one flatting board/core storing table /7/ belonging to each one can be found. In the same line the centrifugal core making machine /11/ with the belonging work-bench /12/ and core-storing table /7/ are placed. Above the line a monorail conveyor /13/ is serving for the transport of the resin coated sand and of the heavy core boxes between the centrifugal core making machine and the shell-baking kiln.
The assembling, sticking or clamping the shell moulds together take

place in the neighbouring workshop having a groundspace of 12x7 m-s. Along the walls storing stands are available for the tools, clampers and yokes /17/ and for the ready shell moulds and cores to be assembled /16/. For the assembling of the double/profiled shell moulds to stack moulds and for their clamping two work-tables /18/ are provided for. For the purposes of sticking the simple shell moulds together, and drying the glue, a sticking table /19/ and two shell assembling presses /20/ are serving.

The assembled shell moulds will be prepared and put down for the casting on a gravel-bed or a simple sand bed as it is necessary, in the next door shop with a groundspace of 12x4.7 m-s. The moulds will be cast there with molten iron or steel brought from the melting plant of the existing foundry in ladles hanging on the pouring monorail conveyor /22/. The already solidified castings together with the shell moulds will be collected and transported into the neighbouring room with the help of a monorail conveyor /21/ placed above the pouring line. In this room which has an area of 6.5x12 m-s, the collected moulds and castings will be put into the steel-plate containers /26/ placed on a carriage /25/ movable by hand on a railway /24/. The full containers can be lifted down from the carriage and placed on the shake-out apparatus /27/ or next to it by the monorail conveyor /23/ perpendicular to that above of the pouring line. In separate containers /26/ placed in the line below the monorail conveyor the knockedout castings, and the foundry return (gating systems and scrap) will be collected separately. In the container placed on the carriage /29/ movable by hand on the railway /28/ located under the shake-out apparatus the burnt out resin coated sand will be collected. When the container is full with the burnt out sand, the carriage in the areaway /30/ under the shake-out machine will be pushed outdoors and lifted out of the areaway by the monorail conveyor /23/.

The castings, foundry return and burnt out sand will be removed and transported by electric fork-lift trucks. The transport of the resin precoasted sand into the workshop will also be carried out in the same way. The ready shell moulds and cores will be transported within the workshops by hand wheell-barrows.

TUNGSRAM Co Ltd.

Summary of Lecture on Africa Workshop, 17th October, 1989

Gentlemen!
Our aim is to supply you with the best products in the field of illumination, vacuum engineering, machinery and electronics. Technical information is available on all our products, enabling you to identify the very item you want, and you can be certain that your commercial relationship with TUNGSRAM will be as satisfying as the performance and reliability of TUNGSRAM products.
TUNGSRAM's customer service and technical staff will be pleased to assist you in solving your problems. No doubt you will find the opportunity of surveying some of the latest TUNGSRAM products at various exhibitions and fairs throughout the world, and acquire detailed information from TUNGSRAM specialists staffing our stands.
It is a pleasure to us to present our business associates, partners and friends this attached booklet to give a concise review of today's activity of our almost 90-year-old TUNGSRAM. We hope it comes to light the connexion between TUNGSRAM's necessaries on your interest for example the castings, and from what sources meet the Company's needs.
First of all some sentences about our main profile, the light sources products. TUNGSRAM is the one of the very first companies in the world who have engaged in manufacturing of electric light sources. Since its foundation, many scientists and experts in TUNGSRAM R & D laboratories have been made substantial contributions to the research, development and popularity of this important way of making artificial light. Their epoch-making results were the creation of the world's
- first tungsten filament incandescent lamp some 80 years ago,
- first krypton lamp and
- first GK (large crystal) tungsten filament lamp in 1931.

The production of light sources has remained our main activity. Our share in the world's light source business is considerable; with our up-to-date energy saving high quality products all problems can be solved that may arise in illumination. This is our list about TUNGSRAM's products:

* GLS lamps
  - Krypton lamps
  - Decorative lamps
  - Crown mirrored lamps
  - TUNGSRAFLEX and TUNGSRAPAR lamps
* Fluorescent lamps
  - dia.26 mm energy saving fluorescent lamps
  - Fluorescent lamps in standard, de luxe, coloured, rapidstart and reflector coated versions
* High pressure discharge lamps
  - Sodium vapour lamps
  - Metal halide lamps
  - Mercury vapour lamps
  - Blended light lamps
* Vehicle lamps
* Photo, cinema and theatre lamps
* Xenon lamps
* Special lamps
  - Miniature halogen lamps
  - Subminiature lamps

- Infrared lamps
- Quartz lamps
- Germicidal lamps
- Water treatment lamps
- Ultraviolet lamps

ENGINEERING SERVICES

Lighting systems

Relying on CAD (Computer Aided Design) optimalizing methods, we are contractors for delivery and installation of complete lighting systems (light sources, projectors, luminaries, circuit elements, masts, cables, etc.) for all indoor and outdoor applications (e.g. residential lighting, office lighting, industrial lighting, stage lighting, roadway lighting, sport lighting, illumination of monuments, etc.).
We offer pre- and after sales service: consultancy; replacement sources and components are promptly delivered.

Vacuum engineering devices and machines

Since early periods of its existence, TUNGSRAM has paid attention to the development both of its products and of the relevant processes that has been inseparable from the improvement of the machines and equipment themselves. As a consequence of these efforts, almost all tools and equipment, production lines designed to increase the capacity and to introduce new products and processes, have been built since several decades in TUNGSRAM's own engineering works.
All over the world, our machines are competitive with the products of other leading vacuum engineering machinery firms and in several fields TUNGSRAM is absolutely leading; e.g. in cap filling machines; lamp testing machines; machines for electrostatic bulb coating; lamps ageing complexes: lamp assembly lines with continuous motion, output 5000 lamps/hour; a production line for fluorescent lamps, output 3600 lamps/hour, full-automatic production lines with intermittent motion conceived for general lighting service lamps and decorative lamps, output 2600 lamps/hour; equipment for the glass industry; machines for bulb and tube production; installed all both in TUNGSRAM's own plats and in several other countries on five continents.

Electronics

Electronics is the youngest but one of the most promising branches of TUNGSRAM. Its share in TUNGSRAM's gross products is getting higher every year. The very diversified product classes in this field are:
* Theatre lighting equipment
* Electric controls for the illuminating engineering
* Electronic equipment for the automotive industry
* X-ray picture intensifier and corrector
* Monochromatic video display modules
* Lasers for medical and industrial applications
* Process control equipment and instruments for machines and production lines, etc.

Vacuum electronics

Our electron tubes and other vacuum electronic products as transmitting and generator tubes, travelling wave tubes, cathode-ray tubes, monitor

tubes, etc. are used in many fields of the electronic industry. Almost all members of the product line are interchangeable with products of other top manufacturers.
TUNGSRAM vacuum electronic products are available also as industrial and commercial semi-products (display modules, supply units, magnetron operated industrial heaters, transmitting tube generators, etc.).

Mechanical engineering

Important traditional manufacturers of light sources and electronic products begun their activities in envolving mass production, usually by supporting their own methods and technique through individual research and development of both equipment and machinery. This need prompted TUNGSRAM to create an independent branch in mechanical engineering with leading capacity in Europe to supply the light source industry and related fields with machines, tools and production lines. The all-round readiness of TUNGSRAM's machine consruction is obvious: we are able to come up to the demands in all fields of our industry, namely in common raw material processing, in assembly and in packing. TUNGSRAM's range of machine production comprises equipment for the manufacture of all current light sources.
The succession of generation is a striking feature of TUNGSRAM's historic assembly lines. Early production lines with intermittent operation have been followed by advanced up to date high-speed lines with continuous motion. Equipment for light source components and part production has been developed on the basis of new material quality requirements of progressive techniques used in assembly operations.
Extensive experiences gained in basic methods of component production, especially in the powder metallurgy, the casting methods namely heat-resistant precision castings with high accuracy, the silicate industry and the warm and cold processing of non-ductile metals paved the way for the development of machinery for interests far beyond the proper scope of light source manufacturing. The resultant wide range of products enables TUNGSRAM to give full satisfaction also in versatile machinery supplied either to small or medium-size plants, or as contractor for delivery and installation of turn-key plants, or in providing advanced know-ow for specific objectives in the lamp production and in other related fields.
It is difficult to conceive of TUNGSRAM without its modern mechanical engineering. Obviouslyin this leaflet it would be difficult to give details of some 6 to 7 thousand various types of equipment of its own manufacture. However, to enable you to get an overall picture of the feasibilities of our Company, the main fields will be listed in which we offer machinery with varied yields for different purposes in compliance with individual requirements.

Light source production: complete production lines, individual machines and equipment for the manufacture of the following:
- general service lamps
- miniature lamps
- vehicle lamps (headlights and ancillary lamps)
- decorative lamps
- fluorescent lamps
- gas discharge lamps

Glass production:
- furnaces, batch houses and complementary shops for glass production for vacuum engineering

- lamp bulb production lines, machines
- tube drawing lines for glass products used in vacuum engineering and pharmaceutics
- other individual glass processing machines and know-how

Production of metal components for vacuum engineering:
- tungsten, molybdenum processing
- filament production
- cap production with presses, electroplating and other complementary units
- electrode production

Presses, metal working and processing units:
- stage drawing machines
- high speed presses

Vacuum equipment, testing devices for all fields of the light source production:
- vacuum pumps
- valves for vacuum systems
- equipment for photometry

Packing machines

Naturally, these lists are by no means exhaustive. They may be completed by some of the services supplied by TUNGSRAM with the deliveries of machinery in order to meet our customers' individual circumstances and requirements.
On request or for orders we elaborate or help in studies of rentability of new plants and we propose preliminary projects. Furthermore, we supervise installation plans of final projects and offer consultancies for initiatives in this branch.
Both with individual machines and production lines, we supply know-how based on well-proved reliable methods used in one of the world's oldest light source plants.
On special request, our customers' experts are trainedby our own specialists in one of Europe's most important light source plants, providing skills in the operation and maintenance of our machinery.
Installation and pilot production, assistance in new plants by TUNGSRAM's delegated expert considering special needs are contracted.
Light source component deliveries for production using TUNGSRAM methods are ensured.
Machine parts are supplied for all our machinery, provisions being covered for long therm.
Our after-sales service gives immediate assistance when needed, mainly to newly erected pioneer plants.
In addition to know-how supplied for complete light source production plants being installed, TUNGSRAM is contractor for the study, delivery and pilot running of all supply services and complementary units necessary for the production, and this may also be extended to the delivery and installation of a whole turn-key plant.

Our eminent references are those plants and enterprises run in Europe, Asia, Africa and America, where TUNGSRAM machinery is operated using TUNGSRAM know-how.
Thanks for your kind attention.

Brief summary of lecture of AGRIKON Foregin Trade Office
on 11th October, 1989

Gentlemen!
Our firm AGRIKON, one of the largest Hungarian agricultural machinery manufacturers was founded in 1949, former name MEZŐGÉP-KECSKEMÉT.
At the present time AGRIKON has six factories and more than three thousands employees.
The export accounts for a larger share (60 percent) of the turnover than the domestic sales. The business activity of AGRIKON extends to 22 countries. But there are certain principal markets which take up a larger share of the company's export. For the time being the main markets are the following: Algeria, Austria, Bulgaria, China, Czechoslovakia, the Federal Republic of Germany, the German Democratic Republic, Finland, Iraq, Iran, Poland, the Soviet Union, and Turkey.
In the course of almost four decades this company has become a well-known firm having a high reputation in the field of
* grain storage
* canning technologies
* tillage tools
not only in Hungary,but on three continents, thanks to the outstanding design and development work, the up-to-date manufacturing equipment making reliable machines, the continuous spare parts supply and the training of the operators.
Sixty high-skilled engineers take care of the customer's demands to manufacture "tailor-made" or turn-key projects with realibility, low cost operation and high performance. The experts of AGRIKON are ready to elaborate the economic calculation of the planned project or establish the appropriate agricultural and infrastructural background.
As regards the experiences of the company, it can be mentioned that the reference list of the grain storage plant's customers is rather long.
We have to say that AGRIKON has won several World Bank financed bids among them the commissioning of 44grain storage plants.The total storage capacity of these plants is about 400,000 tons.
AGRIKON has made the design work, the manufacture of the equipment and the installation of the plants within a few months. After this brief introduction, on the following the subject is the grain storing metal silos, the complementary equipment and machines designed, manufactured and installed by AGRIKON.
The metal silo plants can be used for receiving, cleaning, storing and handling the grains, as e.g.
* cereals (wheat, rye, barley, etc.)
* maize (shelled)
* sunflower
* rice
* dried pea, beans, etc.
The main reasons of the development of the up-to-date and reliable grains storage plants are:
* the rapid increase of the agricultural production
* the appearance of new types of seeds,of cereals and corns giving higher yield
* the demand for storing without losses
AGRIKON, as an experienced and reliable metal silo manufacturer, can offer metal silo plants ensuring
* minimal grain loss

* separation of goods being stored according to sort and quality
* fully mechanized material handling
* the possibility of various technological processes carried out simultaneously (e.g. charging, cleaning, discharging, rotating, ventillating)
* profitable and safe opperation
* requirement of minimum manpower
* quick charging and discharging
* satisfaction of the special local requirements of the customers, considering the connection possibilities to the existing projects (e.g. mills, other-storage facilities, animal fodder mixing plants) and to the infrastructural equipment.

And now some words about the different types of metal silos.

* BS-type metal silo bins

  The corrugated bins of BS type are manufactured in large quantities. The yearly production capacity is 1.5 million tons.

  The wall-thickness of the silo bin is between 0.8-5 mm, and the height of one element is 1.2 m. The wall elements are assembled by galvanized bolts and the watertightness is ensured by the sealing material placed between the parts covering each other, during the erection. Galvanization on both sides of the plates is between 200-600 gr/m^2 according to the customer's requirements.

  Galvanized steel posts placed vertically on the outer side of the silo mantle ensure the required stability of the bins. Diameter of the silos can be varied between 3-24 m, while the storage capacity of one bin can be altered from 9 to 9,000 m^3 depending on the diameter and the height, you can see the table on the desk.

* KS-type metal silo bins

  Based on log development work the KS type metal silo bins are the reliable equipment of grain storage.

  The tower jacket is made of 800x831 mm units with 1.5-5 mm thick steel plates. The elements are assembled by galvanized bolts, the watertightness is ensured bu a packing material placed between the joining surfaces of the units during the erection.

  The silo bins are made in three diameters: 6.7, 9 and 15 m. The quantity of the stored grain can be varied between 176 and 2,400 tons/bin. The specific weight of the stored grains is 0.8 t/m^3. Owing to its inner surface shape, the KS type bins are suitable for storing of fluory matters, too.

* KL-type metal silo bins

  AGRIKON purchased the manufacturing licence of LIPP System from the Silo Verfahrens AG (FRG) many years ago for national needs. This patent relates to the so-called spiral-slotted silo bins. The types of LIPP silos manufactured by AGRIKON are marked by KL. These up-to-date silos can be erected quickly. Their diameter can be changed - at demand - from 4 m up to 18 m. The storage capacity varies between 100-3,000 tons/bin.

  We can supply many type of foundations for silos, in accomodation of present needs and used technologies for charging and discharging.

Starting up for handling the stored grains we supply ventillation system for silos, because of some heat is generated usually in the stored grain. The grain temperature is measured and controlled permanently by cable thermometer built in the bins. Whenever necessary, the cooling process may be carried out by ventillating or by the transfer of the grain from one to another.

The different road and railway receiving hoppers are shaped on the

basis of experiences existing tor many years at AGRIKON. The receiving hoppers can be built in various alternatives according to the customer's requirements, and are connected to the metal silo plants. The hoppers can be manufactured of steel or of reinforced concrete equipped with a grid. In case of road hoppers the hydraulic truck tilters can also be installed for accelerating the reception. The different hoppers can be equipped with a roof structure.

The AGRIKON silo plants are mounted up with material handling and cleaning technology. It makes possible the cleaning before and after charging, allowing the formation of technological variants essential for material handling.
The clening unit can be completed with automatic and semi-automatic sales of different capacity which ensure the exact recording of the different grain quantities. The cleaning and scaling equipment can be put in the work-tower made of concrete or steel structure - according to the customer's demand. In the work-tower are placed the equipment of material handling, cleaning and scaling.
The main parts of the cleaning and material haling system of AGRIKON:
* grain cleaning equipment
* filtering cyclone
* fans
* supports for the cleaning euipment
* scales.

AGRIKON has also developed horizontal and vertical transporters having capacities between 20 and 200 tons/hour. These equipment can be transported and installed in modul units according to the local demands. The material handling system of the AGRIKON metal silos form an integral system.
The chain conveyors are of steel-frame execution, equipped with material feeding and discharging mechanism. The grain is transported by the chain conveying elements. Driving is carried out by a driving-gear type elecric motor.
The horizontal transporter equipment are used for charging the grains into the silos and for discharging them from the silos. Three basic types are manufactured by AGRIKON:
* screw conveyor
* belt conveyor
* chain conveyor
The bucket elevators serve for continuous bulk transport of grains and other materials of max. 1 kg/dm^3 specific weight, of max. 35% humidity content, which do not become pulpy, do not stick together and are free from caustics. The transport is carried out by a vertically operating, fully closed, self-carrying material handling machine through its steel buckets mounted on a canavas-layer type rubber belt.
Gate valves ensure the grain forwarding from the conveying equipment to the silo or from the silo to the conveying machine. The main types of the gate valves:
* mechanical
* pneumatical
* electrical
The gate valves are made in different sizes according to the capacity of the conveying machines.
The grain to be stored can be guided in two, three or more directions by the means of the distributing boxes built in the gravity-type conveying pipes. The AGRIKON distributing boxes are of two, three or

more ways system. They can be controlled from the central control desk by the mean of a built-in position indicator.The dstributing boxes can be electromechanic or electropneumatic operation.
The transit bin of continuous operation is an essential accessor of the material handling system. By its use, the safe provisional storage of the grains is possible before delivery. The transit bins ensure the quick, continuous, gravity-type loading of the trucks. The transit bin receives the grain by gravity through the chute system, then stores and evacuates it through a discharge orifice controlled by a gate valve to the truck being under it. The bin is equipped with level indicator checked from the central control unit. The bin can also be operatedfrom the central control unit.
The chute pipes are destined for forwarding the grain by gravity between the machines or among the machines and the storing units. Operating of the chute pipes makes necessary a 45° descentangle at least in comparison with the horizontal. The main parts of the chute pipes are:
* pipe
* bent pipe sections
* pipe clamps.

The oeration of the silo plant is made from the control room provided with a control desk and an electric main distributor. One attendant can operate the silo through the control desk. In automatic operation the technological equipment begin their work and stop their operation in a determined sequence, while in manual operation the sequence of starting and stopping the procedure is controlled by manual control of the operator. The PLC (Programmable Logical Counter) equipment controlling the automatic programs is built in the control desk. It is suitable for execution of the program control, as well as for receiving the signals arriving from the silo plant, for processing these signals and for giving commands. The control desk has complete technological flow diagram where lights indicate the operation.

Finally, the reader has received a short general information about AGRIKON. Consequently it is known for out prospective business partners that the "headquarter" of AGRIKON is in Kecskemét in a distance of appr. eighty kilometers from Budapest, the capital of Hungary.
Easier way having contact with partners from abroad, our FOREIGN TRADE MANAGEMENT, is working in Budapest.
Thanks for your kind attention.

Brief description of prewiow Mr Michael Toth's workshop
in the scope of Small-scale Industries
on 13th October, 1989

Ladies and Gentlemen!
Scene of the prewiew and information was the Kistelek and Szöreg Workshop of Mr Michael Tóth artisan.
The main point of the short preliminary instruction was the display of the activity of KTV (Enterprise for Production of the Small-scale Industry) though the development of Mr Michael Tóth's workshop.
Hungary has a population of about 10 million people and about 150 thousand artisans and craftsman among them. They mainly are engaged intransport and services and about 25 thousand of them in producing goods.
KTV is a state-owned undertaken but was founded by KIOSZ the safeguarding society of artisan's interests, 35 years ago. It's main business is **CONTRACTING** and **ENGINEERING** at it's own expenses and risks. It has a two-way activity. It procures orders and possibilities of work from the state owned enterprises and contracts with them for the accomplishing of the work itself. It employes and contracts artisans for the carriing out the ordered work. This way it transforms the possibilities of work. The same course of proceedings goes also in the opposite direction. KTV offers the capacities and products of the artisans to the state-owned enterprises.
The activity of KTV is advantageous for both the artisans and state-owned customers. It assures the customers of carriing out the ordered work with good qualityand assumes responsibility forthe fulfillment and quality both, also in case when the artisan will be taken ill or in case of a brakedown of a machine etc. KTV gives safety to the artisans with paying for their products immediately after manufacture.
In addition to the **CONTRACTING** activity escribed above it's **ENGINEERING** activity is also highly important, in form of giving licences, know-hows, producing technologies as well as financial and technical management of developments and modernizations of the workshops necessary to the production.
The workshop having been the scene of the preview is the private property of the artisan Mr Michael Tóth. This workshop has been the scene of a rapid development during the last years. The workshop that had about 2-3 employees 10 years ago has about 60 employees now.
Developing the workshop also second-hand machines have been installed after their complete renewal and modernization. These developments are results of the close co-operation with KTV as a safe background.
The output of the two workshops having been taken a view of amounts to 2 million U$D per year. The small-scale workshop operates in close co-operation with other small-scale workshops and with state-owned enterprises, too. The missing technological operations (for instance the hardening) will be carried out in co-operation.
The displayed two workshops belong to the first 25 private owned workshops in Hungary. KTV contracts with about four-thousand small-scale workshops most of them having smaller capacity then the displayed ones.
The enterprise works not only in the iron-industry but in all branches of the industry.
KTV is also active in exort, operating as a foreign trade enterprise

first of all with european connections.
It is willing to co-operate with all representants of the participant countries, first of all in setting up small-scale workshops in all branches of industry.
Thanks for your attention.

Brief summary of lecture of Ujszeged Weaving Trade Enterprise (USZV) on 17th October, 1989

Gentlemen!

USZV has been developed to an important technical cloth manufacturing enterprise from the "Kenderfeldolgozó Vállalat" (Hemp Enterprise), which had been founded 100 years ago.
The basic products are the textiles apt to use for various technical purposes and willbe utilized almost in all branches of industry. The products of USZV will be used in the rubber industry as inlet cloths of the conveyer belts of several streght category. The basic material of these cloths are polyamid, polyester and viscose. They also will be used to wrapping inlets of the V-shaped belts as well as to wrapping of hoses. The screen-textiles of high strength made of polyamid will be used as edge-cloths in the manufacture of rubber tyres. USZV manufactures big quantities of filter textiles, which will be utilized in the food-, pharmaceutical-, chemical-, and petrochemical industry. The basic materials of filter textiles are PA, PES, PP and polyethylene monophylaments. In addition to manufacturing textiles the enterprise also makes ready made articles from filter cloths according to the customer's demands and also undertakes development tasks together with the customers.
They also developed the manufacture of membrane filter candles. Filtering the fruit juices and beers through them, the food industry will be able to guarantee longer duration times for these products.
As cloths for outerwear they produce cloths for blue jeans, the production of them has already tradition.
As a result of a recent development the confection of blue jeans happens in the modern dressmaker's shop, where pairs of trousers,shirts and jackets will be manufactured. roducing sport-wears for "karate" and "judo" has been a great success. In addition to the weaving of these textiles also the confection will be carried out by the enterprise itself.
The largets group of products of USZV are awning-cloths made of natural and synthetic basic material. Of pure cotton, cotton and phloem-fiber mix made canavases will be manufactured for the purposes of coverings, car-tilts with water-repellent impregnation, antiputrid and flamiess curing.
The auning-clothes made of synthetic yarn and smeared with PVC are very modern and will be used for the purposes of various caverings, car-tilts, textile buildingssuch as pneumatic tents etc.
The sunshade products, the colour-scheme of which is going with the fashion tendencies, will be made of polyacrylnitril and have a very long duration of life as well as a big aesthetical value.
The bag-textiles made by the enterprise represent the most modern basic material of the luggages and are produced of polyamid. They will be manufactured plain-dyed or colour-striped acording to the vogue.
USZV has a meaningful raschel-sack manufacturing capacity. The market of these raschel-sacks are Europe, the USA and the Far East. The sacks will be produced according to the request of the customers with various colours, dimensions, weight, furnished with propaganda-ribbons or other complementaries to the customer's liking, packed by pieces or by coils according to the filling-in technology to be used.

Also the production of nets, made of synthetic basic material without any knots, has also traditions already. Their fields of employment are fishing, gardening, game catching and other technical purposes.
The confection of the technical textiles happens in conformity with the demand of customers.
Canvas coverings, big pneumatic tents and various dwelling tents will be produced in big series.
The technological methods of the firm are modern. The synthetic twisters, cross-winders and computer-controlled ribboned warper represent and outstanding level. The weaving mill's machine stock of the firm mainly consists of modern weft carriing weaving machines. The complementary machines are also modern.
The staff of the enterprise continuously keeps a look-out for the technological and product-development trends and carries out quick and effective modification of the product-structure.
Weaving indusrty and the foundries are interconnected by the elements and spare parts for machines. Many of our machines and equipment have been made by enterprise itself and need several kind and type of castings; mainly with high accuracy and plained surface. Important factors of castings are the duration of life of elements depending on the processes of foundries. Many times the accomodation of accessorities needs reach detailed small castings from acide-resistant or tear-resistant steels with fine plained surface and all this requirements will be satisfied by foundries specialized for precision casting technology. Most of all, the efficiency of weaving enterprise depends on the inoperative times of the machines, waiting for the repairing or spare parts. That is the reason why needed a good connection between our enterprise and precision casting foundries, and not only for repair works but for the developing of machines, too.
Thank you for interest.

Lecture of UVATERV Enterprise at UNIDO/ARCEDEM Workshop and Study Tour on 17th October, 1989

Title of lecture:

Foundry for Grinding Balls
with an Out-Put of 2000 t/year

Introduction

Our firm projects and implements among it's other activities various types of complete foundries. Our technicians are at our customers disposal in the field of foundry technology, metallurgy and other problems to securethe most economical easting production with the plants or equipment delivered by us. Within the range of our foundry program we undertake projecting, delivering and putting iron-, steel-, and metal foundries into operation.

In this very information sheet we want to present you such a foundry the products of which have a very good market in all countries of the world.

The auxillary material supply of the ever developing cement industry's ball and tube mills got internationaly in the limelight. There is a constant effort to product milling balls of high durability.

Our firm posseses the production technology of such milling balls. The balls produced with the technology proposed by us, casted into permanent mould the so called dies, secure the cosumption value as low as 50 g/t cement, do not break and maintain their spheroidical shape while grinding.

Grinding balls produced conventionally, casted from white cast iron have a consumption value of 900-1000 g/t cement and forged ones 700-800 g/t cement.

The conventionally casted balls have because of their frequent breaking, the forged ones because of their deformation only a low durability and therefore they also reduce the efficiency of the grinding.

We chose the out-put of the foundry 2000 t/year. This is a medium size foundry the investment funds of which will be refunded within a few years.

The chosen production program according to the requirements of the majority of the cement factories is shown in table 1.

This production program has been planned for 210 workdays per year and two shifts a day 8 hours each. This plan of work can naturally be altered according to the local conditions in which case also the out-put will be altered.

The producing and ancillary workshops are placed in a building consisting of three naves. The melting, easting and moulding of the dies takes place in the medial nave having a span of 18 meters. We place the charging area with the charging scale, the sand dryer, the sand preparation plant with the sand storage, the core-making shop, the transformer room of the arc furnace, the compressor room as well as the mainterance shop into on of the naves having a span of 12 meters. We place the chemical laboratory, the die making and repairing shop, the sorting, cleaning and fettling shop into the nave with a span of 12 meters situated collaterally. We put the transformer sub-station, the

social rooms and the storages into a separate building.

Description of the producing ancillary workshops

Charging area:
At the charging area near the arc furnace the ingredients of the cold furnace charge will be kept and the cutting up of the thread-like materials, the preparing and scaling of the charge takes place.

Melting plant:
The melting plant consists of one piece of 3 tons arc furnace and of a mains-frequency, coreless type induction furnace plant. The latter consist of three furnaces (inductors) with a holding capacity of 1.5 tons each and two electrical furnaces can be operated simultaneously. The induction furnace plant serves for the holding of the molten metal. The devices for the walling of the arc furnace roof, for the lining, drying and preheating of the ladles also are set at this area.

Moulding and casting area:
At this area three pieces of die-casting rotary tables with twelwe positions each are situated together with the pouring monorail and the casting transport conveyers. At the territory behind the machines the no-bake moulds of the die to be retrieved can be easted.

Sand preparation plant:
The washed, clay-less sand will be stored here. The fluidized bed sand dryer, the pneumatic tube conveyer conveying the dried sand into the bins of the core-sand mixers and that of the mixer-slinger (continous mixer) will also set in place at this territory.
The moulds of the dies to be retrieved will be made also in this work-shop by means of the mixer-slinger and using the no-bake moulding process.

Core-making shop:
The cores needed to the grinding-ball casting productionwill be made using the waterglass-CO_2 process.
The waterglass-containing core-sand will be mixed in two 'S-blade' sand-mixers situated above the core-shooting machines. For core-shooting four pieces of shooting machines with a capacity of twelwe litres each will be available.
The hardening of the cores will take place by means of CO_2 gas. A CO_2 metering device serves for the evaporation and feeding of the CO_2 gas.

Cleaning and fettling shop:
In this shop the breaking off of the ingates and risers as well as the grinding of the studs on the balls will be carried out by hand operations.
Special clamping-apparatuses will be applied to the grinding.
After grinding the milling balls will be classified wiht a ball classifier of simple structure according to their diameter, and collected in holding boxes.

Heat-treating shop:
The heat-treating unit consists of an oil heated, continous, run-through system heat-treating furnace containing in itself the air-cooling device, too.
The heat-treatment consists of a heating up to 950° C, a holding and a

cooling-down in an air-flow.

Die (metal-mould) making shop:
In this shop the machining of the eastings of the dies for the retrieving purposes will be carried out. We'll place into this shop a universal milling machine, two pieces of turning lathes a column type drilling machine and a drawing table. The turning lathes have to be supplied with a device apt to spheroical turning.

Maintenance shop:
In this shop which contains both the locksmith's and the electrician workshop the repair and maintenance works of the technological equipment as well as the assembling and repair of the ball-dies will be taken place.

Energy supply

Power supply:
At the primary side of the electric network 20 kV voltage and at least 160 kVA current intensity have to be provided by the local electricity works. The performance of the arc furnace's transformer is about 2000 kVA and to the operation of the ancilary devices 30 kW is needed. The arc furnace has it's own transformer. To provide for the power-supply of the remaining equipment a transformer sub-station with a performance of 1600 kVA and voltage of 380/220 V has to be planted.

Oil supply:
For the storage of heating oil a storing-tank of 50 m³ holding capacity will be provided.
The daily oil consumption comes to about 1.5 m³.

Water supply:
For the water supply serve two quite separate systems. One of them provides for the drinking water and water for other communal purposes, the other one is a closed circuit serving the breaked cooling water supply.
For drinking and other communal purposes 15 m³ water/day for cooling 25 m³ breaked water are needed.

Compressed air supply:
The compressed air requirement comes to 5 m³ inhausted air per min.

Quality control system:
The quality control consists of two parts:
- analysis of the liquid-iron and
- examination of the ready products.

Analysis of liquid metal:
The analysis of the liquid metal will be carried out in the chemical laboratory using the wet method. The investment of a spectrometer is unjustifiable because of the few sorts of used alloys and the very rare change of alloys.

Examination of ready products:
The ready products have to be examined of the point of the view of breakability (fragibility) and surface hardness.

Development possibilities

We'll plant the technological equipment of the foundry in such a way that utilizing the development possibilities the out-put of the foundry could be doubled.

To double the out-put which means a capacity of 4000 t/year the following further equipment have to be provided for.

The melting plant is to be amplified with one more arc furnace and two peaces of mains-frequency coreless induction furnaces (the same sizes already planned).

The number of the shifts for the arc furnace roof walling, the ladle lining, drying and preheating has to be increased.

The number of the die-casting rotary tables has to be doubled, the pouring monorail and the casting transport conveyers have to be lenghtened according to the planning.

The core-making shop is to be enlarged according to the planning and the number of the technological equipment doubled.

The sand-preparation shop answers the purpose only the number of the shifts is to be increased from two to three.

In the cleaning and fettling shop in addition to the enlarging of the territory the number of the grinding machines have to be increased from six to twelwe.

One more heat-treating furnace ought to be planted.

The energy requirements will also increase so the energy supply must also be doubled. At the transformer sub-station an empty cell has to be provided for already during the building. At the other energy supplying units either the number of the equipment or their capacity have to be increased.

Thanks for your kind attention.

JOINT ARCEDEM/UNIDO WORKSHOP AND STUDY TOURS ON CORE METALLURGICAL INDUSTRIES, RACKEVE, HUNGARY

DIMENSIONING OF FOUNDRIES, TECHNICAL CALCULATIONS

By Mr. Moric Benyovszky
Vice-President, Foundry Section
Hungarian Mining and Metallurgical Society

The basis of every technological calculation in foundry design is a production programme which should be built-up correctly. The questions to be answered in a production programme are as follows:

- What are the mass groups, which are representative in the production envisaged, and what is the tonnage per year to be produced in the different mass groups?
- What is the representative average mass/casting in each mass group?
- Which are the different alloys to be produced in each mass group?

If the above data are available, the production programme can be built up resulting in a table by breakdown in:

- mas groups
- alloys
- tonnage to be produded/year
- average piece weight of castings
- pieces of castings to be produced/mass group

Furthermore, the following data are required prior to start technological calculations:

- yield (in %)
- tolerated rejects (in % of good casting)
- time basis (hours/year)
- main energy carrier available
- electric energy (tension in V and connection value in MW)
- portable and industrial water (in m^3/day)
- oil (calorific value)
- natural gas (calorific value)
- storage times necessary for raw materials (days)

Dimensioning thereafter starts with the melting shop. After having decided which kind of furnace will be the most adequate for the specific production programme, a shankey diagram has to be set in order to determine the amount of the following masses:

- cold charge
- melting losses
- fluid metal
- raw castings
- cutting and grinding losses
- good castings
- recycling material - rejects included, and finally
- bought scrap

The amount of melting units to be used will be determined by the cold charge and the time basis.

The second step is the dimensioning of the moulding shop. Based on the mass groups of the production programme the dimensions of the flasks to be used have to be determined, whereby mostly in the practice several flask dimensions will have to be used. In this stage of foundry design, the amount of castings to be produced, i.e. the pieces/year will be the basis for the calculation.

The area required for the moulding shop will be composed of two parts, i.e. the proper moulding area and the area for the flasks ready previous to pouring + the flasks cooling previous to shake out. As a basic principle, this latter area should always be checked by an operating diagram in order to ensure a proper correlation with the melting shop.

The next step will be the dimensioning of the sand preparing plant. Initial data for this plant will be based on the flask dimensions as well as on the amount of flasks to be produced, taking into consideration factors for sand spillage and also for compression, if green sand is used. The amount of sand to be turned over per hour will determine the capacity of the mixers required and the sand handling system (belt conveyors, bucket elevators, pneumatic transport system, etc.) Special care should be paid to the volume of bins foreseen in order to ensure the adequate sand volumes, wherever required. This investigation should be integrated into the operating diagram.

The next shop in the projection sequence is the core-making shop. The amount of cores necessary has to be estimated based on the production programme, according to the type of castings to be produced. It is logical that a foundry producing pump castings will need much more cores than a foundry producing piston rings. Based on the amount of cores necessary and estimated from the production programme, the amount of core-making machines will be calculated whereby the possibility of making cores by hand and a combination of machine and hand core-making always may be possible. The area for the core shop will consist of two parts, i.e. the proper core-making area + the area for core storage, since a core shop has to produce the cores at least 24 hours previous to their use. The last workshop in foundry design will be the fettling shop. Dimensioning has to go out of the pieces to be produced per year. The sequence of fettling operations is as follows:

- Raw cleaning of the castings by shot blasting
- Breaking of or cutting of runner systems and ingates
- Fine cleaning of castings, mostly by hand on grinding machines, by pneumatic hammers and hand grinding tools

Storage facilities are not called workshops, but are also essential parts of the foundry. Two main stores have to be taken into consideration, i.e. the scrap yard and the finished goods storage. The area of the scrap yard has to be calculated according to raw material requirements/day and to the storage time described in the initial data. The area of the finished goods storage will be calculated according to the production in pieces per year, taking into consideration an average storage time of 21 days, if the customer did not give any other storage time.

In the lecture lay-out, examples will be shown for iron, steel and non-ferrous, i.e. aluminium foundries.

Comparison is made according to calculations methods mentioned above, but showing at the same time the lay-out of both melting shops. As a matter of fact, both melting shops are in running foundries. The importance of proper selection of material handling equipment is pointed out based on the two melting shops investigated and based on literature. Examples of summary formulas can be given as follows which characterize fundamental rules of material handling.

JOINT ARCEDEM/UNIDO WORKSHOP AND STUDY TOURS ON CORE METALLURGICAL INDUSTRIES, RACKEVE, HUNGARY

THE DESIGN OF CAST CONSTRUCTIONS

By Mr. Zoltan Gal

The production of castings is of decisive importance in a modern industry. To meet the technical requirements, designer and production personnel have to work in close co-operation. The design of a cast part should take into account all the physical and chemical changes of the metal during solidification, that is, the designer has to know the properties of the alloy of which the casting is to be made. To make comprehensive decisions on selecting the proper grade of the material and the design of the casting, the designer has to brush up his basic knowledge of material. This paper deals with ferrous materials. In order to understand what will follow later, we should have a short look at the Iron-Carbon (Fe-C) diagram.

Care should be taken, however, when making use of this diagram to remember the actual behaviour of the alloys, this being different from that in the state of equilibrium. It should be kept in mind that the diagrams of equilibrium are giving information only on the chemical composition, but the phases produced and the final composition of the alloy can only be known if the speed and mechanism of solidification is also known in a given point. The diagram shows clearly that alloys with either lower or higher carbon content than the eutectic (4.3% C), solidify in a temperature range while the eutectic solidifies like unalloyed metals so the temperature of liquid and solid lines are the same. The heat content of the molten metal and the heat on the surface determine the speed of cooling that is why the ratio of volume and surface is called "reduced wall-thickness".

$$R = \frac{V}{S} = \frac{\text{Volume}}{\text{Surface}}$$

has to be studied.

Due to complicated interrelations, the chemical composition of the alloy should be selected to be the most suitable to the cooling conditions, i.e. to get the optimal properties of the material. In case of grey-iron, these interrelations can be

pictured in two dimensions by the so-called "saturation factor" which is at the same time characteristic of the quality of cast iron:

$$T_C = \frac{C}{4.23 - 0.312\ Si\% - 0.275\ P\%}$$

The structural elements and form of the graphite are different in castings of different wall thickness even if the cooling speed is the same.

The linear shrinkage of cast iron is between -0.5% and +2.5% depending on the chemical composition, the shape and the cooling conditions of the iron casting as well as on the accuracy of moulding. The contraction of the metal when it is still liquid is one of the main reasons causing cavities. The linear and volumetric shrinkage of the solidifying iron is due not only to the thermal contraction but also to the diffusion processes taking place in the metal, the phase transformations, the graphite formation, etc. also have their effects. This shrinkage has to be taken into account when calculating the sizes of the casting. The stresses prevailing in the castings and the probability of the development of hot or cold crackings are also defined to a certain extent by shrinkage.

When making the patterns not only the shrinkage of the solidifying metal should be considered but those size-changes, too, which occur during heat-treatment. The dimensions of castings during martensitic hardening grow perceptibly (by 0.1 to 0.3%). The importance of graphite precipitation or decarburization during heat treatment is even greater. If, for example, 1% of C precipitates in the form of graphite, 2% growth in volume or 0.67% increase in length is the result. Decarburization of the castings, however, results in decrease of volume.

The shape of the casting can sometimes be such which prevents the shrinkage of the metal - this is called thermal prevention of shrinkage. The different parts of the casting cooling at different rates can influence the shrinkage also. On the other hand, the shrinkage can be prevented mechanically, too, by a core too hard to collapse, by core pins or flask and sand-grids, etc.

These mechanical and thermal limitations in shrinking result in considerable stresses inside the casting. Depending on the strength and location of such stresses, hot or cold crackings can

appear The design of a casting not only needs consideration of mechanical nature, but also other knowledge: these altogether ensure the good quality castings.

The basic task in designing a casting lies in selecting the right production process which ensures high techno-economic indices. This can only be solved by a close co-operation with designer and foundry technologist.

Points to be Observed

- Transitions, rounding offs, grooves and curves of wall, their shaping
- Forming the internal cavities
- Forming ribs and rib-reinforced plates
- Forming of centers

JOINT ARCEDEM/UNIDO WORKSHOP AND STUDY TOURS ON
CORE METALLURGICAL INDUSTRIES, RACKEVE, HUNGARY

METALLURGICAL PROCESSING OF FERROUS ALLOYS

by Mr. Zoltan Gal
Chief metallurgist GANZ-MAVAG

Principal types of equipment for melting ferrous alloys

The cupola is the furnace best suited for the production of ordinary grey iron because of the ease of operation and satisfactory results. It is however essential that special quality grey iron such as nodular or malleable cast irons should be of uniform quality, particularly in the case of the production of low-weight, thin-walled castings. This requirement is not easily met and the duplex process has therefore been developed. Melting is carried out in a cupola furnace and an electric furnace is used for subsequent heating, desulphuring and alloying. Mains frequency furnaces of the crucible or channel type are most suitable for this operation. High frequency furnaces are used to produce various types of grey iron and steels not requiring major deslagging. Where abundant electric power is readily available, electric arc furnaces, a well known and highly flexible type of steel-making equipment, are used. The heat produced by an arc using three-phase electric power is used to melt the steel. Some foundries use the cupola/converter process for steel production.

Before discussing metallurgical processes, it may be useful to draw attention to various features of furnace construction.

The cupola furnace is in essence a vertical cylindrical pit lined with refractory material. The cast metal is withdrawn from the bottom of the furnace, above the furnace bed. The ducts through which the air needed to burn the coke is admitted are 1 to 1.5 metres above the bed of the furnace. The crucible is below, and the melting zone is above, as is the pre-heating zone, the height of which is 4.5 to 5 times greater than the internal diameter measured at the channel level to the tuyere. In order to increase the economy of operations, various modern variants are available. The best known are:

- Cupola furnaces with additional gas or oil firing;
- Twin blast furnaces;
- Hot blast furnaces;
- Cokeless furnaces.

In addition to economy, the temperature of the molten metal is a major consideration. This should be between 1,480 and 1,500 degrees centigrade so that the residual heat is sufficient to process the metal in accordance with technological requirements.

The duplex process meets this requirement, as well as the need for economy. A mains frequency channel or crucible furnace is installed at the cupola. The crucible furnace can be used for various processes whereas the channel furnace can be used only for additional heating.

In addition to its use in steel-making, the electric furnace is a very efficient item of equipment in foundries. From the electrical point of view, it comprises a high capacity switch, a transformer and an inductance coil. The furnace is fitted with auxiliary operating mechanisms and controls as well as mechanisms to rotate the roof and move the electrode. It is usually constructed with basic lining. Acid lining is infrequently used because of the processing requirements.

A crucible furnace consists essentially of a crucible surrounded by a copper coil. High frequency current is fed into the coil, which is water cooled by means of a square sectioned tube. The current induces current in the metal to be melted, which acts as a secondary coil, and thus heats it. Mains and medium frequency furnaces are available. In addition drum furnaces are used for small quantities. These are batch furnaces capable of producing half a ton an hour.

Melting of ferrous alloys

Cupolas
Electric furnaces
Induction furnaces

In the cupola furnace the carbon content of the coke charge is burnt using oxygen from the air.

Suitable fluxes must be added with the charge to ensure the satisfactory operation of the furnace. The composition of the slag released by the furnace lining during melting and resulting from impurities in the charge must be adjusted so that it is fluid and has an appropriate melting point. As the slag is insoluble in the molten metal and its specific weight is less, it separates from the metal. The normal amount of slag is 5 to 10 per cent of the weight of the iron. The added limestone and fluorine flux is 3 to 5 per cent of the weight of the charge.

Additional heating is essential to ensure the desired mechanical properties of the iron and the absence of defects.

Economical operation providing additional heating in accordance with the Jungbluts formula can be achieved if the cupola has good instrumentation and the blast air can be controlled.

Electric furnaces are used in steel-making and in foundries. They can only be operated satisfactorily if the available mains power is at least 80 times higher than the transformer rating of the furnace in use. In electric arc furnaces the molten metal is heated through the slag, thus producing highly reactive slag. As a result the metallurgical processing is such as to produce high quality grey iron or steel, even using lower grade raw material. In producing grey iron the metal can be remelted simply and desulphuring and dephosphorizing can also be undertaken. In manufacturing steel, ranging from the simplest carbon steel to steel alloys meeting widely varying specifications (resistance to heat, wear, etc.) more complex processing is necessary to ensure satisfactory quality. After melting the phosphorus and sulphur are removed and the steel is then prepared with refining slag and alloying and deoxidation are undertaken as necessary.

The induction furnace is used in foundries as a remelting or holding furnace. The temperature of the slag in an induction furnace is too low for satisfactory reactivity. A good quality charge without impurities can be used since only one remelting is undertaken. For this reason the electric furnace simplifies operations.

In medium frequency furnaces, the electromagnetic field penetrating the metallic material in the charge produces heat and causes melting. The degree of penetration depends on the power applied and the density of the charge.

In mains frequency furnaces the depth of penetration is small if the charge is cold and lumpy. Their efficiency is therefore low if a cold charge is used. If melting is necessary, one third of the melted metal is left in the furnace and the new charge is added to it. Efficiency is thus improved and rate of melting increased.

In most cases mains frequency furnaces are used in conjunction with other furnaces as holding furnaces. Duplex arrangements using electric arcs are most frequent. These systems are used in producing grey, malleable and nodular irons.

Drum or Selemar furnaces are used only for desulphuring. No other operations are undertaken.

The selection of suitable foundry equipment is highly important for the economic production of high quality castings, as is the use of the best methods of processing feasible with the equipment employed.

ANNEX 2.

MEMORANDUM OF UNDERSTANDING

prepared upon the completion of UNIDO/ARCEDEM Workshop on Core Metallurgical and Other Industries - Project No. XA/RAF/89/618 - organized in Szeged, Hungary in the period of 7th-22nd October, 1989. The followings were agreed upon:

1.) The representatives of ARCEDEM express their full satisfaction over the programme preparation and implementation. The lectures, plant visits and consultations were beneficial to the participants and contributed to widen their knowledge and experience in industrial engineering, design and manufacturing in metallurgical and other core industries.

2.) It is acknowledged that emphasis has been laid during the workshop on agro-industrial sector, spare part and parts manufacturing, tool and die-making, as well as recycling of industrial ferrous and non-ferrous waste materials.

3.) As outlined in the Note for the File dated October 10th, 1989 there is a need to review the present generalized training to more specific and specialized training in areas of special concern to core sectors. It was agreed that training programmes - with expected number of 5 to 10 participants and with a duration of 2 to 3 months - will be elaborated by TESCO and submitted to UNIDO and ARCEDEM within two months on the following sugjects:

for TECHNICIANS

a) Pattern Making
b) Tool and Die Making
c) Mould Making

. / .

d/ Core Making
e/ Die Forging
f/ Tool Grinding
g/ Precision Casting
h/ Gear Cutting and Generation

for ENGINEERS

a/ Tool and Die Design
b/ Pattern and Mould Design

4./ It has been emphasized that ARCEDEM intends to establish a model/modern foundry including cast iron and steel making technology for manufacturing of spare parts, mechanical handtools, agricultural implements, etc.
ARCEDEM expresses readiness to welcome a UNIDO expertise through collaboration with UNECA for the preparation of a project document, techno-economic study and a human resources development programme. In this connection TESCO expresses its readiness to participate in the preparation and implementation phase of the project if UNIDO and UNECA express their wish. Terms and conditions may be negotiated and agreed upon at appropriate time.

5./ It has been agreed that the Evaluation Sheets collected by the completion of the Workshop shall be sent to UNIDO and a summary will be incorporated in the report of TESCO to be submitted to UNIDO.

6./ It has been agreed upon that Draft Project Proposals prepared by the participants of the workshop shall be

collected and transmitted to UNIDO's Metallurgical Industries Branch to generate new project ideas and opportunities in the member-states of ARCEDEM.

7./ It has been agreed that the co-operation between ARCEDEM and TESCO should be continued in potential fields of common interest. Therefore, the parties shall keep each other informed on developments and eventual occassions of co-operation.

Made in Szeged, Hungary on October 20th, 1989

for ARCEDEM

for TESCO

AFRICA WORKSHOP AND STUDY TOURS ON CORE INDUSTRIES

PROGRAMME

HUNGARY
SZEGED

09.10.—20.10. 1989.

TESCO

5th " AFRICA WORKSHOP AND STUDY TOURS ON CORE INDUSTRIES "

H U N G A R Y

- Szeged -

9-20th October, 1989

P R O G R A M M E

Monday 9th October

8.30	Breakfast in the hotel
	Free programme
11.00	Official opening of the workshop
	Presidium:
	Mr. A.K. Mitra (Representative of UNIDO)
	Mr. S.B. Lwakabamba (Representative of ARCEDEM)
	Mr. E. Iván (Chairman of the Hungary-UNIDO Committe)
	Mr. I. Lengyel (Deputy Director General of TESCO)
	Mr. Gy. Nanovfszky (Vice-president of the Hungarian Chamber of Commerce)
12.30	Coctail-party
13.00	Free programme
14.00	Plenary lectures
	'Relationship between the UNIDO and Hungary' presented by Dr. Endre Iván
14.30	'Relationship between the UNIDO-ARCEDEM and TESCO' presented by Dr. Péter Holczer
15.00	'Activity of the Hungarian Chamber of Commerce' presented by Dr. György Nanovfszky
15.30	Introduction of the programme by Mr. Pál Narancsik
16.00	Consultations
	Free programme
19.00	Dinner

Tuesday 10th October

7.15	Breakfast in the hotel
8.00–10.00	Lecture of PHILAXIA Vaccine Producing Company presented by Mr. Miklós Volkai and Dr. Péter Rédey - system of veterinary hygiene in Hungary - activity of Philaxia - appliances for veterinary science - establishment of veterinary science plants
10.00–12.00	Joint lecture of GENERALIMPEX Foreign Trade Company and Grandiens Innovation Laboratory presented by Ms. Zsuzsanna Böröcz and Mr. János Sulyok - agricultural anti-rendom system which is unique in the world (application of multifactorial measuring system in agriculture) - multifactorial optimatization of industrial technologies
12.00	Lunch
14.00	Introduction of SZIKKTI (Research Institute of Silicate Industry) - organization of training programmes in Hungary and abroad - video show
16.00	Introduction of FŐVÁROSI CSATORNÁZÁSI MŰVEK (Canalization Works of the Capital) presented by Mr. György Dienes - special methods for pipe-laying - video show
19.00	Dinner

Wednesday 11th October

7.15	Breakfast in the hotel
8.00-12.00	Activity of AGROBER, the main fields of collaboration - the export and main contracting activities of the AGROBER-AGROINVEST in the field of agriculture and food industry presented by Mr. Róbert Szipli -'How to manage integrated food industrial centre in the developing countries' presented by Mrs. Lászlóné Dombai - video show about the different kinds of agricultural and food industrial technologies
12.00	Lunch
14.00	The main fields of GÖDÖLLŐI AGRÁRTUDOMÁNYI EGYETEM TERMELÉS-FEJLESZTÉSI INTÉZETE (Production Development Institute of the University of Agrarian Sciences) - Containers for fruits and fodders presented by Dr. Győző Ruda - improvement of yield in the agriculture presented by Dr. Ferenc Dull - protection against agricultural parasites presented by Dr. Etelka Nikodémusz
16.00	Lecture of VILLAMOSENERGIAIPARI KUTATÓ INTÉZET (Research Institute of Electric Industry) - employment of hydrocarbon burner fuel in the industry and at power stations presented by Mr. György Planeczky
17.00	Introduction of AGRIKON Foreign Trade Office presented by Mr. János Vikol
19.00	Dinner

Thursday 12th October

7.15 Breakfast in the hotel

8.00-10.00 Lecture of ÉPÍTÉSGAZDASÁGI ÉS SZERVEZÉSI INTÉZET LEÁNYVÁLLALATA (Affiliated Company of Coordination Institute for Construction Industry) presented by Mr. Imre Mórocz
- maintenance and management of storage facilities, implementation of computer systems
- presentation of programmes and appliances

10.00-11.00 Introduction of ÉPÍTŐIPARI INNOVÁCIÓS BANK RT. (Innovation Bank for Construction Industry) presented by Mr. István Molnár
- general introduction abour the Hungarian banking system
- importance of building industrial innovation

11.00-12.00 Lecture of HYDROPLASTIK Ltd. presented by Mr. Ferenc Tuboly
- procedures of water purifying (drink water, waste)
- supplied valves, tanks
- appliances for environmental protection

12.00 Lunch

14.00-18.00 Lecture of ÉLELMISZERGÉPIPARI VÁLLALAT (Company for Food Machine Industry) presented by Mr. SÁndor Buránszky
- appliances in milling industry
- shops in developing countries
- video show

19.00 Dinner

Friday 13th October

7.15	Breakfast in the hotel
8.00-12.00	Lecture of KISIPARI TERMELTETŐ VÁLLALAT (Co. for Small-scale Industries) presented by Mr. Sándor Hódossy - organization of handicraftsman in Hungary - visit the workshop - consultations
12.00	Lunch
14.00-16.00	Introduction of FŰTŐBER (Enterprise for Air Conditioning and Air-Engineering) - production of air conditioning appliances - organization of production in workshops - video show
16.00-18.00	Visit and introduction about small scale factories
19.00	Dinner

Saturday 14th October

8.00	Breakfast in the hotel
9.00	Free programme (shopping)
13.00	Lunch
14.00	Sight-seeing tour Free programme
19.00	Dinner

Sunday 15th October

8.00	Breakfast in the hotel
9.30	Visit the museum
	Free programme
13.00	Lunch
	Free programme
19.00	Dinner

Monday 16th October

7.15	Breakfast in the hotel
7.30	Departure
8.30-12.00	Visit the ALUMINIUMSZERKEZETEK GYÁRA (Factory of Aluminium Structures) - visit the workshop - consultation
12.30	Lunch
14.00-16.00	Introduction of KÓRHÁZTECHNIKA RT (Shareholder's Co. for Hospital Technics) - lecture on its activity /therapentical equipment/ - consultation
16.00-18.00	Lecture of LÁNG GÉPGYÁR LEÁNYVÁLLALATA (Affiliated Company of LÁNG Machine Factory) presented by Mr. István Muri - special welding technologies - video show - consultation
19.00	Dinner

Tuesday 17th October

7.15 Breakfast in the hotel

8.00-12.00 Visit the ÚJSZEGEDI TEXTILGYÁR (Textile Factory of Újszeged)
- visit the workshop
- consultation

12.00 Lunch

13.30-16.30 Visit the factory of MAGYAR KÁBELMŰVEK (Hungarian Cable Works) in Szeged
- visit the workshop
- consultation

16.30 Free programme

19.00 Dinner

Wednesday 18th October

7.15	Breakfast in the hotel
8.30	Departure
9.00	Visit the spare parts production factory of IKARUS AUTOMOBILE FACTORY in Szeged - video show - visit the workshop - consultation
12.00	Lunch
13.00	Visit the waste recycling plant of MÉH TRÖSZT in Szeged - visit the workshop - consultation
	Leave for Budapest
19.00	Dinner
20.00	Sight-seeing tour in the capital town

Thursday 19th October

7.30	Breakfast
8.00	Departure
9.00	Visit the central plant of IKARUS AUTOMOBILE FACTORY - video show - lecture - visit the factory - consultation
13.00	Lunch
14.00	Introduction of MIKROSYSTEM - employment of computer-technics - hardware and software - demonstration
17.00	Leave for Szeged
20.00	Dinner

Friday 20th October

7.15	Breakfast in the hotel
7.45	Departure
8.00–10.00	Visit the KÉZISZERSZÁMGYÁR LEÁNYVÁLLALATA (Affiliated Company of Hand-Tool Factory) in Szeged - visit the workshop (precision foundry) - consultation
10.00–12.00	Visit the VAS- ÉS FÉMÖNTÖDE (Ferro- and Metal Foundry) in Szeged - visit the workshop - consultation
13.30	Lunch
15.00	Closing ceremony of the study tour
16.00	Free programme
19.00	Dinner

Saturday 21st October

7.15 Breakfast in the hotel

8.00 Leave for Budapest Airport

FOR YOUR KIND ATTENTION

The Organizing Committee of the Workshop established a

S e c r e t a r i a t e

to be found 09.11-20.10 in the secretariate room where from 8.00 a.m. to 5 p.m. you will always find colleagues:

Mr. Pál Narancsik
Mr. Endre Vízvárdy
Mr. Péter Holczer
Ms. Andrea Desits
Ms. Ágota Kósz

who will be at your disposal for any question you may ask.

The Hungarian Government has negotiated a special group rate which enables participants to live comfortably within their daily subsistance allowance. All participants receive Hungarian Forints 600.- daily for small expenditures.

Your address is: "FORRÁS SZÁLLÓ"
S z e g e d
Gyapjas P. u.
6753

Phone: 06-62-53-422

Exchange in the hotel or some other official bureaues.

For any claim or special wishes do not hesitate to contact the Workshop Secretariate.

PRELIMINARY SURVEYS

PREFEASIBILITY STUDIES

FEASIBILITY STUDIES

TENDER DOCUMENTATION

TENDER APPRAISAL

BID NEGOTIATIONS

PLANNING AND DESIGN

SURVEYING

LANDSCAPING

PLANNING

TECHNICAL DESIGNS

REALIZATION OF PROJECTS

INVESTIGATION OF BUILDING SITES

ARCHITECTURE

INFRASTRUCTURAL WORKS

ERECTION OF BUILDINGS

MECHANICAL AND ELECTRICAL INSTALLATIONS

SPECIAL ISOLATION

CORROSION CONTROL

SUPERVISION OF WORKS

COMMISSIONING

MANAGEMENT

ASSIGNEMENT OF QUALIFIED STAFF FOR PROJECT PERFORMANCE

CONSULTING SERVICES

SUPERVISING OF PRODUCTION PROCESSES

TESTING

RESEARCH AND DEVELOPMENT

MODERNIZATION & RECONSTRUCTION OF PLANTS

ANALYSIS OF PROCESSES

OPTIMALIZATION OF PRODUCTION ECONOMIES

COST CONTROL

SKILLED LABOUR IMPROVEMENT