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Regional Seminar on Machine Tools
in Developing Countries of
Europe and Middle East

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CO-OPERATION
INDUSTRIALIZED COUNTRIES - DEVELOPING COUNTRIES ✓

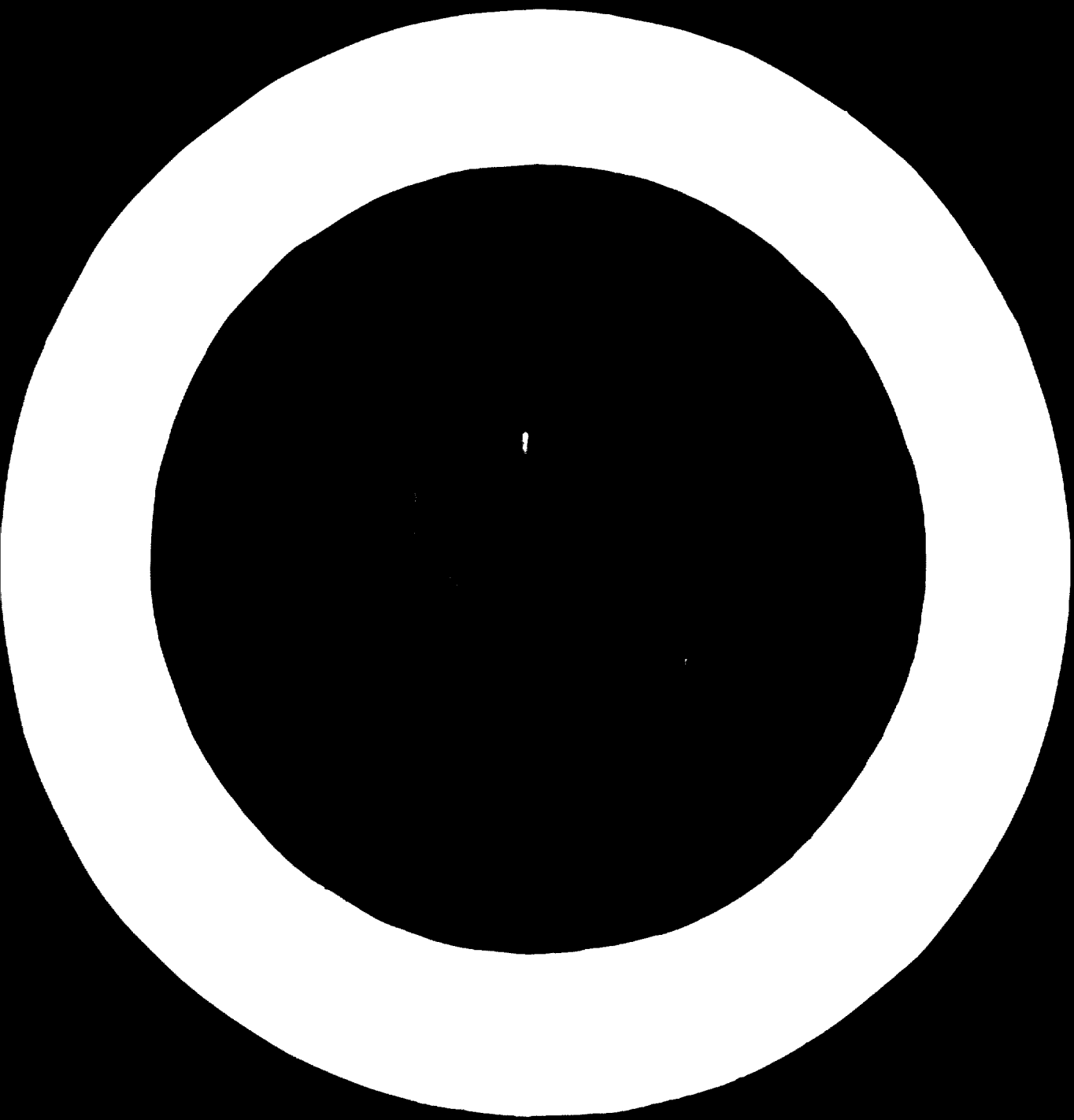
as a factor of Machine Tool Industry
development in Developing countries

by

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The term MACHINE TOOL as used in this paper, describes exclusively Metal Working Machines of the following sorts: Metal Cutting Machines, Metal Forming Machines, and Special Machine Tools.

Introduction

Polish Machine Tool Industry is based on a tradition going back to the end of XVIII-th century, when the oldest of the Polish Machine Tool manufacturing works - the POLKAPA Factory, was starting its production in 1798.

This tradition and dynamical development which has taken place within the last 25 years, has brought the Polish Machine Tool Industry on the 10th place in the world, among the industrialized countries.

The present yearly production reaches about 40000 machine tools being exported to over 50 various countries in all geographical zones. Nearly 30 factories, among which some employ 3000-4000 workers, are manufacturing now a wide range of general purpose machine tools - practically all types - as well as a number of special and specialized machine tools working in fully-automatic cycles, with programme and numerical control.

The following machines should be mentioned: Lathes from 125 mm to 3200 mm turning diameter - including Copying Lathes - programme and Numerically Controlled Lathes, Turret Lathes, Special Heavy Duty Lathes for railway wheel sets, Boring and Turning Mills up to 16000 mm turning diameter, among which also Special Automatic Boring and Turning Mills for railway wheels and tyres, Plano-Millers up to 3000 mm width and 12000 mm milling length, Automatic Lathes, Grinding Machines of various types, Horizontal Boring and Milling Machines up to 200 mm spindle dia, Pneumatic and Steam-Air die Hammers with blow energy of up to 28000 kgm, Presses, Spans-erosion machines and others.

In some lines, for instance in railway machine tools, or in Heavy-Duty Plano-Millers, we have reached the highest world standards, and are competing effectively with the best Machine Tool Firms on such markets as for instance USA or Japan.

In some types of Machines, while developing our own designs - for speeding up this process, or diminishing the expenditures connected - we are entering into co-operation with Machine Tool Firms - best and most advanced in the range of these very machines.

The dynamical expansion of the Polish Machine Building Industry in the course of the last years, has equally compelled us to an intensified import from specialised Manufacturers of machine tools not being made in Poland, with a view to obtaining most advanced machines manufactured in the world at present.

Special or specialised machines designed for performing determined operations and carrying out this work in the best technical and economical manner, began to prevail in our imports intended for equipment of our factories manufacturing, among other also machine tools, contributing thus to improve the precision and quality of machine tools manufactured by our works.

Although ten important Research and Technology Development Institutes and Design Bureaus have been established, working on nearly all problems connected with metal machining and production engineering, design of machine tools and planning of works construction - solving the basic problems - it is not possible for the industry of such a country as Poland - in the day and age of the technical revolution - to be self-sufficient, and cover all its needs in manufacturing basic means for production of machines, industry equipment of and metal goods - without upsetting to the remarkable degree, the rate of the country industrialisation, increase of the national product value and thereby of the well-being of citizens.

The growing need for more and more productive and precision machine tools and transfer lines - connected with the necessity of developing rapidly the manufacture of wide range of new products, in quantities necessitating the use of machine tools and automatic transfer lines intended for big series or mass production - at limited payment possibilities - have induced

us to seek solutions, on the base of which it would be possible for us to reduce our foreign currency expenditures. To reach this aim, we have initiated in Poland the manufacture of some models of machines imported from determined suppliers - on the base of their technical specifications, or have started on their order, the production of machines or assemblies for them. At the same time, the necessity of increasing our exports on individual markets, has induced us to enter into permanent collaboration with some of our machine tools Buyers and Distributors - by adapting Machine Tools to the local market needs, and their sales through these companies as a joint product - with special Trade Mark for this market.

Under these circumstances, the rank of such activity has been raised and accepted as an important factor of import expenditures reduction, speeding up of Technical Development by means of assistance in initiating of local production of Modern Machine Tools - and last, but not least - factor of promotion of exports, the ones of stabilised - for the longer period of time - nature.

This form of activity has been introduced since few years into our programme, and with the ever new experiences gained with every new Agreement signed - is being improved, with a special stress laid on securing of mutual benefits for both partners.

This is because our experience has proved, that only such Agreements survive in the long run.

We do accept also the superiority of this form over the "know-how" or pure Licencing Agreements, which in some cases do not bring expected benefits to the Buyer, this being due to the fact, that Seller's interest ceases often with payment of dues effected. The Buyer is then left alone on his own, and not always is able to cope effectively with all problems brought with the "know-how", and as result - does not achieve profits expected when signing the Agreement.

This form of activity as described earlier - is being called in this country as

INDUSTRIAL and COMMERCIAL COOPERATION

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Developing Countries which are interested in establishing their National Machine Tool Industry, are forced - due to lack of their own technical base and scarcity of qualified staff - to depend to a great extent on a good will of Machine Tool Producers in Industrialised Countries. These Producers are in general interested to obtain maximum income without bothering too much about the impact of such deal on the final technical or economical results of the Partner. It is also often a case, that the Partner from a Developing Country does not realise well at this moment, what his real objectives are.

Hence, a very common case of modern, very well /to well/ equipped factories constructed in Developing Countries - costs of which many times exceeds real profits achieved by the economy of the Developing Country.

Machine Tools produced in such factories - generally of good technical standard - in many cases do not meet the real requirements of local market, while the money spent for investment and running the factory, should have allowed for production of bigger quantities of machines more suitable to market demands.

Without trying to deny a good influence, construction of such factory has on accelerating the process of industrialisation of a Developing Country - one has to state, that the first need for such a Country is to have a very thorough research on Country Economy, his natural resources and plans for development - made, and on the basis of such research, a most economically suited conception of establishing or expansion of Machine Tool Industry in the Country - along with proper training and education of personnel, to take over in future from the specialists of the Industrialised Country the leading role and "put on its own feet" this branch of Country's Economy - should be made.

And this is the problem, in solution of which UNIDO should assist Developing Countries on the first place.

It is obvious, that a newly established Machine Tool Industry will not be able for long years to cover the Country's Developing Economy demand for machine Tools in required types and models - still, well-programmed development of own production

of Machine Tools, based on long term forecast - should secure to the best possible extent the Country interest, in the way of restricting as much as it is feasible - the expenditures for imports of Machine Tools, being usually a very serious burden to Country's budget.

The variety of Machine Tools types, production of which is being commenced in stages - should in its widest selection meet the real requirements of the customers, and contribute to highest degree of utilisation of Machine Tools manufactured and introduced into production process, and thus to most effective utilisation of the money invested.

The process of industrialisation in many developing Countries starts with imports of various machines like road building, pumps, transport means, and machines and equipment necessary for starting the production of industrial goods, industrial processing or storage. Maintenance of those machines requires Machine tools, to carry out current and major repairs.

The establishing of a National Machine Industry at this stage of Industrial Development is not necessary advisable, since Machine Tools required in such Repair Shops could only to a negligible extent be manufactured by a beginning Industry, and mainly because of their kinds, sizes, required accuracy and restricted number of Machine Tools of similar type.

Only the establishing of local Industries manufacturing simple machines like pumps, agricultural machines or the likes, and coming into being of numerous workshops - should justify starting Country's own Machine Tools Industry.

In order to avoid - to a greatest possible extent - the errors in planning of such production, as well as to shorten the period of time required for the commencement - Developing Countries have to seek collaboration of Machine Tool Manufactureres of Industrial and Export Organisations in the Industrialised Countries.

As already mentioned above, a long term Agreement with a Partner from a Industrialised Country - should lie in the interest of a Developing Country. The Agreement should be based on mutual benefits, which are being generated during the course

of cooperation, and hence not a "know-how" or Licencing Agreement accomplished by the purchase of machines and Equipment - but a Cooperation based on joint production, and joint sales, with those benefits rising from sales of ones own products.

In the course of time - when a specified production capacity has been reached - the Machine Tool production works established in the Developing Country should initiate exports of parts and components, and subsequently complete machines - to its Partner in the Industrialized Country, contributing to the process of rationalisation of production in Partner's own Works. This rationalization should rely on terminating the production of this very type of Machine Tool, and covering the demand of the Sale Organisation - through the delivery from the Partner in Developing Country, while increasing the production series of other models, thus improving the production effectiveness indexes, or else - introducing into the production program new models of Machine Tools of more sophisticated nature.

The transport costs will undoubtedly influence the effectiveness of such deal, but it is not meant, that the Machine Tools manufactured in the Developing Country should be delivered to the Partner Works in the Industrialised Country, but in contrary - they may and should be delivered to the Partner's Sale Organisation in the Countries of the same as the Developing Country - geographical Region, with exception of the market of the Developing Country itself.

Such broadly understood TECHNICAL and COMMERCIAL COOPERATION between Industrialised Country and a Developing Country - should in an ideal case base on following sequence of action and principles:

SEQUENCE OF ACTION

1. INITIAL ACTION - establishing the contact between organization/enterprises in the Developing Country, and Industrialised Country - signing a FRAME AGREEMENT

2. MARKET RESEARCH - Deputing of Industrialised Country specialists, to carry out detailed Market Research in the Developing Country, with a special stress laid on:

- stag and art of Country Industrialisation
- demand for Machine Tools in types and number
- payment capability of the home market
- payment capability of the Country as regards permanent imports of Machine Tools
- ditto - as regards new Plant for Manufacturing Machine Tools
- labour availability, qualifications, wages
- raw materials and semi-products sources
- analysis on expected costs of production

3. FORECAST

- working out through the Team of Experts as above, in close collaboration with local Organisations - a detailed FORECAST for the future in its basic aspects, as well as trends, which may influence the feasibility of establishing or expanding the machine Tool Industry in the next 10, and in perspective - 20 years.

4. PROGRAMMING

- of basic kinds of Production Development, like production of complete Machine Tools, coproduction with final assembly, or assembly Plant only - with special consideration of:
 - variety of types and sizes, which are required by the market in biggest number, degree of technological difficulty in their manufacture as compared with the possibilities of a beginning industry
 - introducing by stages individual types of Machine Tools into production
 - introducing by stages into production individual subassemblies and components of different degree of technological

- difficulty, or requiring additional import of production equipment
- proposed number of Works and their specialisation in production of technologically similar types of Machine Tools, e.g. Machine Tools which are most probably to start the process of establishing a Machine Tool Industry in a Developing Country:
 - shaping machines
 - engine lathes and drilling machines
 - eccentric presses, etc.

5. SUBSTANTIAL ACTION - signing of a COOPERATION AGREEMENT and detailed Contracts for various stages of Cooperation, within the frames of FRAME AGREEMENT.

Depending on the status of the Industry in the Developing Country, - whether an entirely new Plant is being considered, or starting of production in an existing one - further action would differ substantially in its range.

In any case however this action should cover the following points:

- 6. PRODUCTION PLANNING** - working out of technological processes, making jigs and fixtures, and putting the work shop into operation - with considerable assistance granted by Specialists from the Industrialised Country.
- 7. PRODUCTION STARTING** - by stages, under supervision of Industrialised Country Specialists, with progressive participation of locally manufactured parts and components, simultaneously restricting the variety of those parts from the deliveries of Industrialised Country. The value of those deliveries to depend on quantitative progression of production development.

8. **INITIAL TRAINING** of **DEVELOPING COUNTRY's** personnel on apprenticeships in the Works of Industrialised Country, as well as on spot - by Instructors from Industrialised Country, gaining the practical knowledge on the machines and equipment installed in the works, in their early stage of erecting and putting into operation.

9. **PERSPECTIVE TRAINING** of personnel - organising through the Industrialised Country a **TRAINING System** with the aim to train - in a long run - the new staff to work in the Workshops, as well as developing a well trained engineering staff meant for gradual taking over of design and development job. This **TRAINING SYSTEM** should incorporate:

- **TRAINING CENTER** in the Developing Countries, situated in the biggest and most modern Machine Tool Manufacturing Works, controlled at least in initial period by specialists from Industrialised Country, covering:
 - Training Workshops
 - Laboratories: measurements, strength metalgraphy, chemical, heat treatment etc.
 - Production Planning Bureau
 - Design bureau for Jigs and Fixtures
 - Design Bureau for Machine Tools
 - Model Sanitary and Social arrangements
 - **VOCATIONAL TRAINING** within each Machine Tool manufacturing works
 - **LONG TERM APPRENTICESHIPS** in the Industrialised Country, for outstanding technical and economical personnel

- SCHOLARSHIPS in the Industrialised Country, with obligatory return and undertaking of job in the Developing Country
 - APPRENTICESHIPS in Sales Promotion units of Industrialised Country on other markets
10. SALES - organising of JOINT SALES ORGANISATION in the Developing Country and neighbouring Markets, or Markets with political, economical or traditional ties with the Developing Country
- gradual substituting of Machine Tools delivered from Industrialised Country, through Machine Tools manufactured by Developing Country.
11. AFTER-SALE SERVICE - organising of joint After-Sale Service Points for delivered Machine Tools - self-dependant, or with existing Service Points for other machines made in the Factory
- training of Servicing Staff
 - setting up of SPARE PARTS production and depots
 - setting up of CONSULTING POINTS to advise users as to PROPER UTILISATION of Machine Tools

In case when a construction of an entirely new Plant is being considered - additional points of action are to be added:

12. WORKS PLANNING - through Specialised Works and Technology Planning and Design Bureau of the Industrialised Country, with special consideration put on local Conditions of Production and Social Conditions of the Developing Country
13. CONSTRUCTION OF WORKS through Civil Contractors in the Developing Country, supervised by Specialists from the Industrialised Country
14. FITTING UP the Works with Machine Tools and Production Equipment delivered through, or on the recommendation of the Industrialised Country.

15. PRODUCTION AUXILIARY SERVICES - setting up of Following:

- Tool Room
- Raw Material and Semi-Products Store
- Maintenance Department etc.

Those are some of the aspects of Development of the Machine Tool Industry in a Developing Country - the one of basic problems being how-ever a background of Heavy Industry, Foundry and Power Plants already existing in a Developing Country to form a source for supply of castings, forgings, power etc.

And all they are purely Technical aspects of the possible COOPERATION - still for positive commencement and fullfilment through both Partners in the long run - of all obligations - it is imperative, the Cooperation being based on definite PRINCIPLES.

PRINCIPLES OF COOPERATION

- PRINCIPLE I - fixing of the SUBJECT and RANGE of Cooperation basing on detailed ANALYSIS OF NEEDS AND POSSIBILITIES of the Developing Country
- PRINCIPLE II - PERMANENT ECONOMICAL INTEREST for both Partners
- PRINCIPLE III - LONG-TERM Agreement to enable the Developing Country to put the production "on their own feet" and form a beginning of National Design and Development Service
- PRINCIPLE IV - establishing of conditions of PROPER UTILISATION of Machine Tools in the Developing Country

Going more deeply in the details of PRINCIPLE II - the following assumption should be accepted:

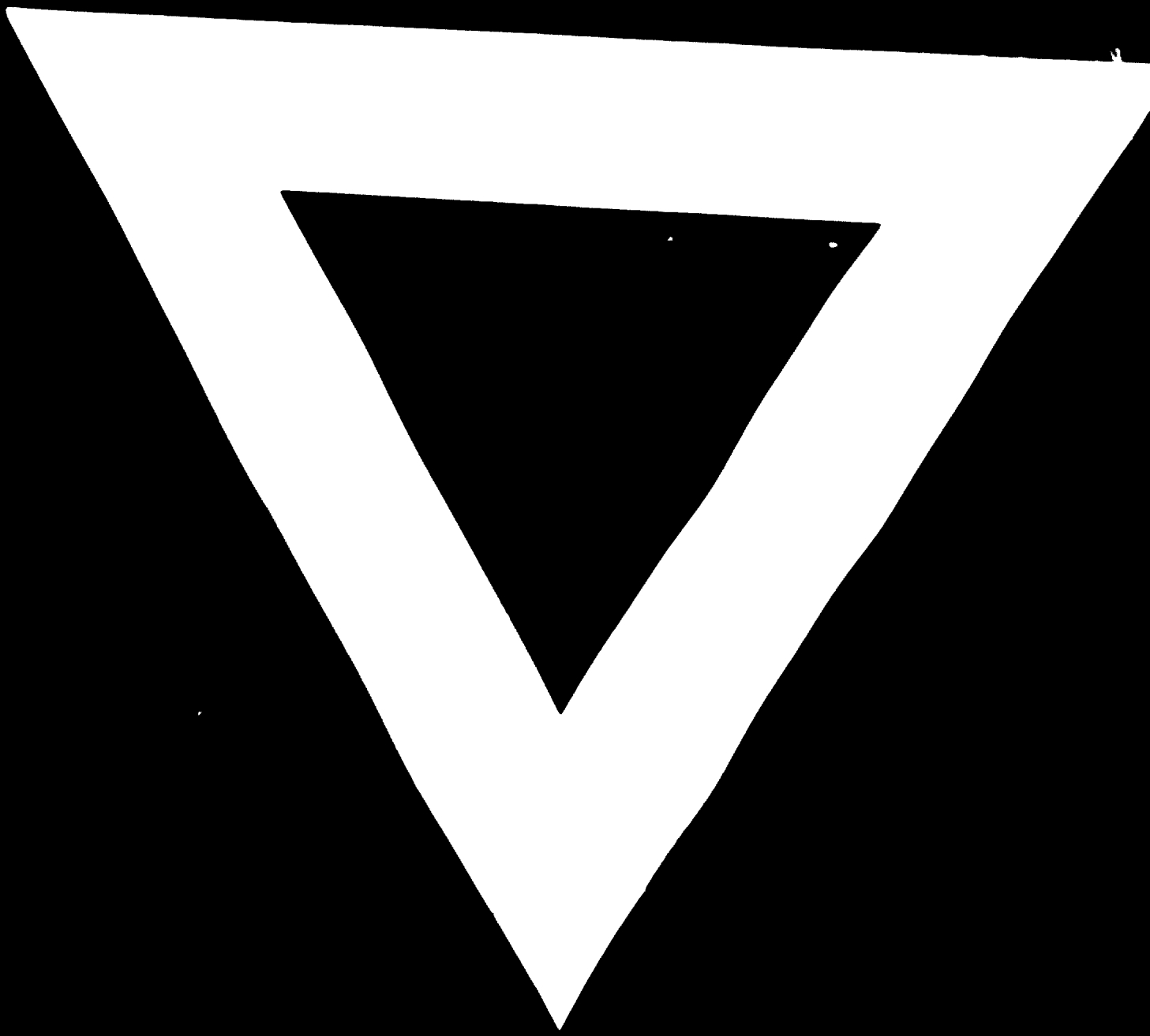
1. Free of charge transfer of Technical Specifications and Processes Production Instructions from the Industrialised Country to the Developing Country /cost of blue prints, shipment etc. to be borne by the Developing Country/.
2. Transfer of "know-how" through specialists, training of local staff, and supervision - against moderate payments, based on rates approved by UNIDO.

3. Balancing within the period of 5 years, the deliveries of parts and components from the Industrialised Country - by means of exports of parts or machines from the Developing Country to Sale Organisation of the Industrialised Country on the neighboring Markets
4. Setting up a Joint Sale and Servicing Organisation for Machine Tools manufactured in the Industrialised Country as well as in the Developing Country - in the region of Developing Country.

Feasibility, or more detailed working out of the above described PRINCIPLES, as well as their modifications - depend on particular conditions prevailing in each particular case, and can only be considered on the basis of detailed analysis of these conditions.

This paper considers cases of Developing Countries with practically no machine Tool Industry of their own, and with limited foreign exchange possibilities, where Financial Assistance from International Organisations or Industrialised Countries would be very essential.





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