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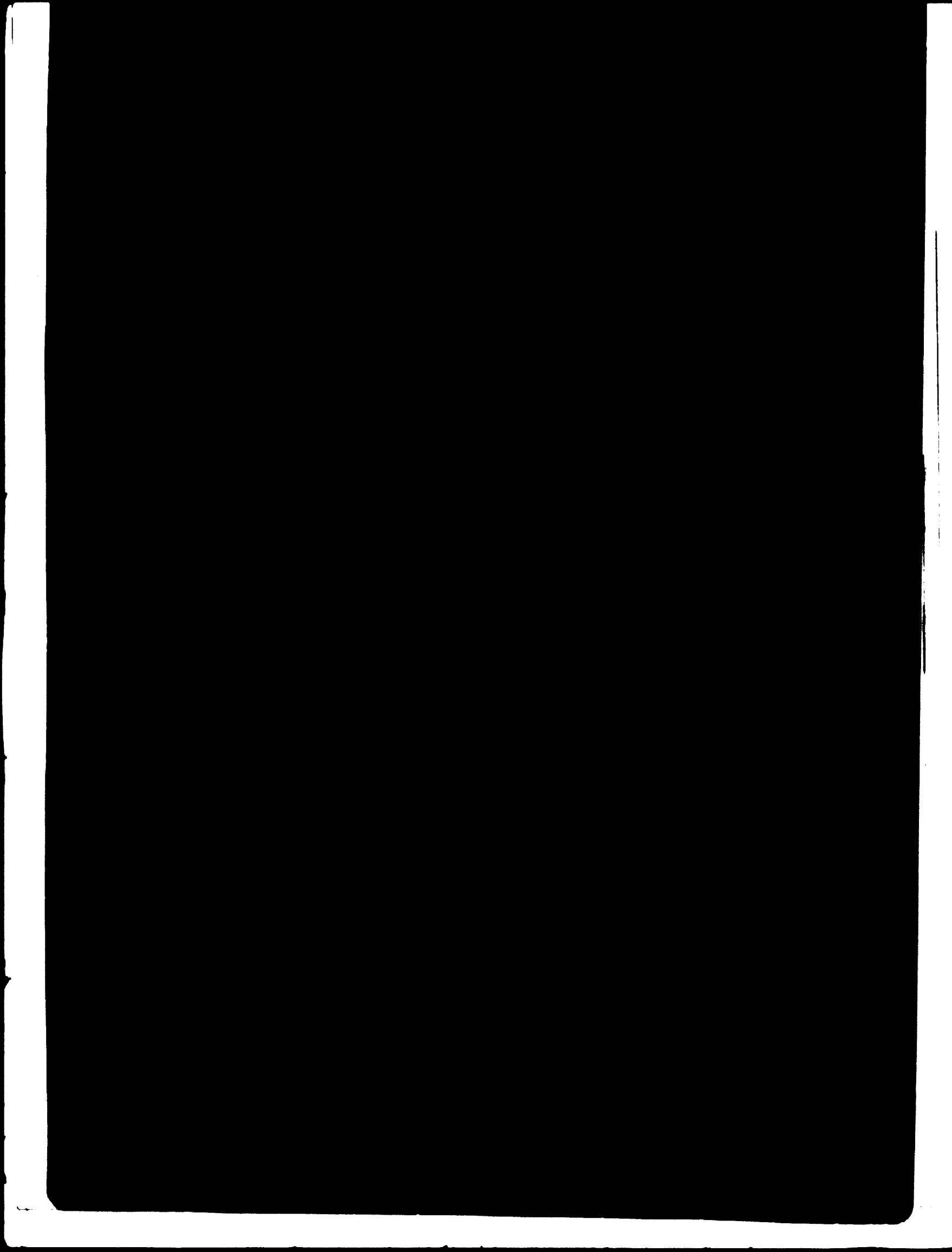
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**MAIN TECHNICO-ECONOMIC REQUIREMENTS  
OF NATIONAL METALWORKING INDUSTRIES ✓**

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## INTRODUCTION

The selection of the particular branch of the economy that should be given first priority is dependent on the conditions in the developing countries. Irrespective of the choice, would it be the petrochemical, the mining, the food processing, the cement industry or something else, it is necessary to develop metalworking industries and particularly the machine tool industry as well, since they are supposed to produce significant part of the required machinery and equipment.

For the developing countries it is extremely difficult to satisfy even part of the needs by own production. Usually their metalworking industry is limited on production of household appliances, simple metal products, a few types of simple machine tools and in maintenance work. That is why, developing countries find it more expedient to import initially the amount of machinery, necessary to start the production and later to develop national metalworking and machine tool industry.

Within the metalworking industries, the machine tool industry plays a key role. Nearly all products are manufactured either by machine tools or by machinery produced by them. The machine tool industry may be considered as the most typical representative of the metalworking industries. For establishment and development of both, the following prerequisites should exist:

- a- availability of machine tools- cutting and forming.
- b- availability of reasonable technological level.
- c- availability of ancillary industries.
- d- availability of skilled labour force.
- e- availability of suitable raw materials.
- f- availability of design capabilities.
- g- availability of electrical energy.
- h- availability of tooling equipment.

In no developing country all these facilities are existing in adequate amount, but some may be in condition useful for the development of the metalworking industries. Any decision concerning either the initial steps, or the further development of the metalworking industries, should be based on thorough knowledge of the mentioned factors. That is why, a careful study of the real situation has to be undertaken.

## PREREQUISITES FOR ESTABLISHMENT AND DEVELOPMENT OF METALWORKING INDUSTRIES

Availability of machine tools is an absolutely necessary condition for beginning any production. A study in this respect should be extended on the existing machine tool work and on the production of machine tools, if any in the country. It should comprise also the import and the export of machine tools.

Analyzing the collected information, a conclusion can be made about what of the required equipment can be made in the country and what has to be imported. Besides, an information concerning the market demand can help planning of the eventual export.

The study of the technological level in the country is closely related to the study of the machine tool park. This level depends on the composition of the machine tool park in terms of correlations between various groups of machines, and on the ratio high productive to universal machine tools. A great amount of old machines, irrespective to which group they belong, has a negative effect, since these machines operate on lower speeds and feeds, and suffer lack of power to utilize fully the new materials used in the cutting tools. Of great importance for an advanced production process is also the presence of:

- a- hydrolically, pneumatically and electrically operated jigs and fixtures.
- b- up-to-date measuring instruments and measuring techniques.
- c- efficient cutting tools as single point cutters and milling cutters equipped with throw-away inserts, combined cutting tools, shaped tools etc.
- d- up-to-date organization of the process planning; preparations of process sheets; time study; use of group technology.

Usually the developing countries acquire from outside the technology for the manufacturing of the selected product. Nevertheless, presence of a reasonable technological level is an asset. The adoption of new technology becomes easier, and less compromises have to be done in respect of the desired accuracy and the proper fulfilment of various process operations.

Existence of ancillary industries is of vital importance for the machine tool and the metalworking industries. Their task is to provide castings, forgings, ball bearings, cutting tools, electrical equipment, plastic components, seals and other items used practically in every product. In many developing countries, the ancillary industries, mainly the foundry and the forgings industries are rather advanced. In case they belong to the private sector, a coordination from the government would contribute to their better utilization.

A few of the developing countries have enough staff with satisfactory skill for running the machine tool and the metalworking industries. For starting and maintaining the normal activity of both the following personnel are required:

- a- managers- top management and middle management.
- b- engineering staff- designers, production engineers, maintenance and electrical engineers, draftsmen.
- c- operators for the machine tools and the equipment.
- d- technicians, fitters, scrapers.
- e- quality inspectors.
- f- economists.
- g- non skilled workers.

As many examples show, an industry in the developing countries can start almost without local specialists and trained operators, provided that foreign assistance is given. For the development of the industry however, it is absolutely necessary to create a national team of manufacturers and gradually reduce the participation of foreign experts to nil. Fulfilling of this task requires:

- a- organization of training programmes in the various fields related to the particular production.
- b- provision of fellowships in industrially developed countries for training of product designers, process engineers, shop foremen, managers.
- c- training on-the-job of engineers and operators.
- d- introducing of new technologies.

National institutes for developing of the industry, which have been established in many developing countries with the assistance of UNIDO, proved to be very helpful in the above.

Availability of raw materials for the metalworking industry is one of the most important arguments in deciding what particular production to adopt. The ideal case is to find local materials of a suitable factory quality and to avoid import. When it comes to the national level production, an increased cost of the final product due to use of imported materials, may be accepted for the sake of accuracy and reliability.

A study of the material sources should contain information about the amount of the raw materials available at the time of the study and about future sources which will appear according the national plans. Besides, attention should be paid to the expected changes in materials prices.

Availability of design capacities is of significant value, since it decreases the dependance on foreign help and shorten the period of time in which foreign experts are employed. Designers are needed in both cases, when developing the industry by own forces, and when a licence has been purchased. In the second case, designers are used for making numerous minor changes in the design in order to fit the latter to the local conditions. Later the designers may be used to develop a national design - for example to redesign certain unit of the product.

I would like to use the opportunity to mention an example from the Bulgarian experience. Several years ago was purchased from a Swedish firm the right to produce the automatic turret lathe "ASR 200". After adoption of the production, a new automatic turret lathe "SR 631" was designed and recently put into production. In this machine, which is a larger turret lathe than "ASR 200", is used some of the know-how obtained through the licence.

Providing of electrical energy to the machine tool and metalworking industries is of substantial importance. This problem has two aspects- producing of the energy and its transportation to the plant. Obviously, location of the plant near to the power station would make things easier, but the advantage of such location is considered negligible if it comes in contradiction with increased cost of transportation of the raw materials and the ready production. The main requirement here is a steady supply of energy and in adequate amount.

The metalworking industries, and especially the machine tool production, require a big amount of jigs, fixtures, press tools, plastic moulds, gauges etc. The more the tooling equipment is available, the more efficient is the particular industry in terms of accuracy, interchangeability and time.

Many developing countries have to buy the tooling equipment they need. The purchases however, require considerable amount of foreign currency and sometimes result in delays of the equipment delivery.

Establishment of local production of tooling equipment is a very proper step, despite the difficulties the governments have to overcome. This production requires a highly skilled team of engineers and workers, who usually are not available in sufficient amount. This obstacle usually is overcome by using foreign help in the beginning. In many developing countries, the UNIDO sponsored Centres for development of the industry are giving substantial help in the provision of the necessary tooling equipment.

#### GEOGRAPHICAL LOCATION

Besides the considered factors, the geographical location of a machine tool or metalworking plant has a definite effect on the production in terms of quantity and quality. In defining the location of a plant the following should be kept in mind:

- a- the vicinity of sources of raw materials is great advantage. This means that the plant should be situated near the local producers, or, near the border points crossed by the materials when they arrive. A good transportation connection has to be provided with these places.
- b- the same for the sources of ancillary industries' products.
- c- the plant should be located close to the recipients of the ready production. If heavy machinery has to be transported, the railroad is the best connection.
- d- proper location in respect of the labour force. Here two differing lines of action should be mentioned. First, it may be found more suitable to establish new production in a place, where labour force with

with some skill obtained from other industries is available. Since that practically means to have some or all of the advantages just listed, such approach is readily accepted. The other line is to provide employment for some less developed regions of the country. This policy puts more problems for the governments and postpone the expected benefits from the industrialization, but it may be hoped that the results would be worthwhile.

- e- optimal location in respect of the climate. Some features of the climate have detrimental influence on the metalworking. High humidity and/or high salinity of the air, causes corrosion, the full prevention of which is considered impossible. Even the partial prevention of the corrosion incurs considerable expenses. Dusty areas provide conditions for quick wear of machine joints due to the abrasive action of the dust particles. The very hot climate requires airconditioning for the people and for the machinery, what means additional investment and consumption of energy. The low temperatures also represent inconvenience, since stable heating is required for the shops and storehouses.

Obviously, the ideal project in which all these conditions are fulfilled, hardly can be worked out. Usually a variant with minimum weak points is accepted.

### PLANNING

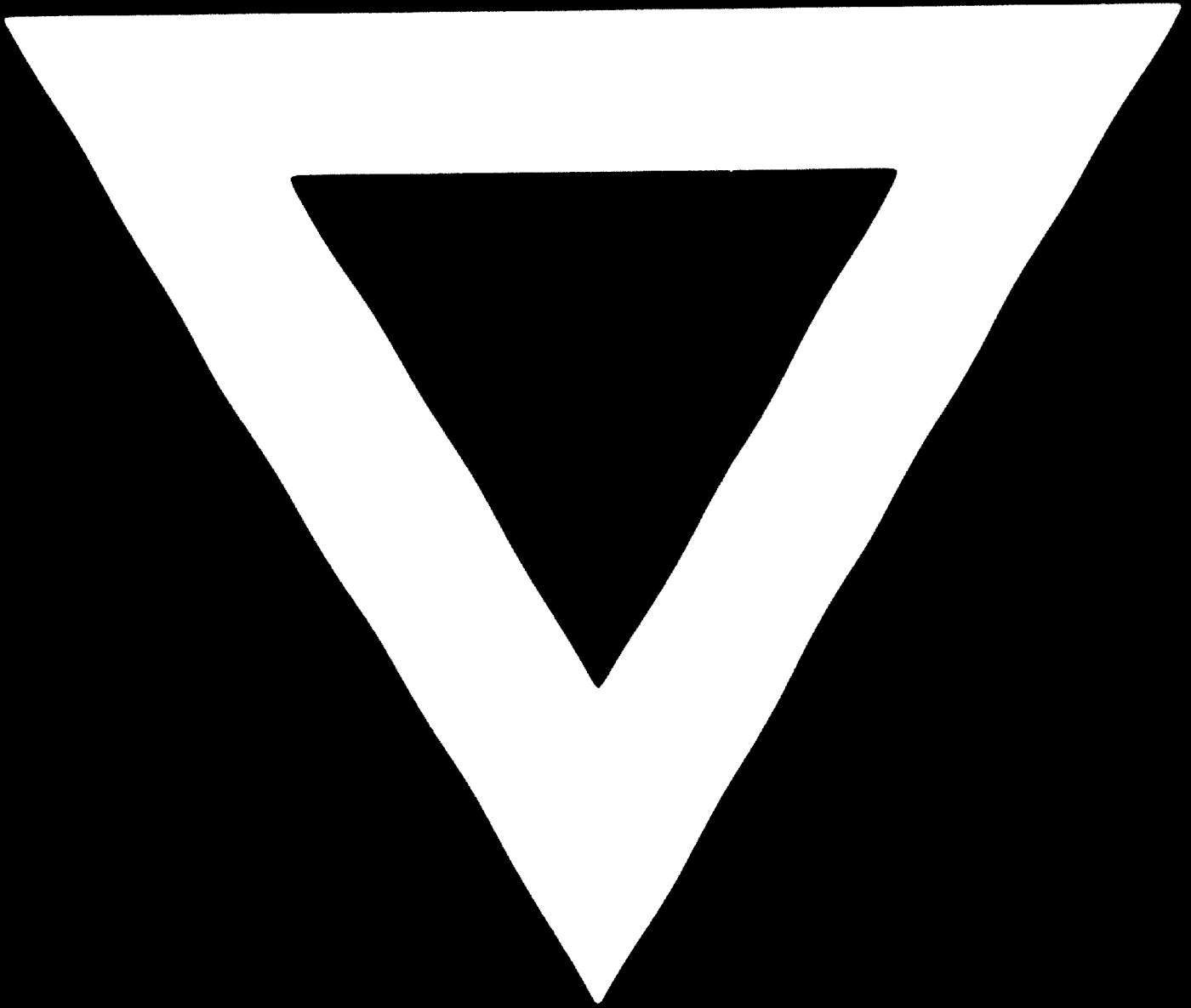
The industrial development of a country should be prescribed by a full programme comprising all branches of the industry. Such programme should cover a long period, established by many countries to be five years long. A metalworking industry, and especially the machine tool industry, due to the relatively slow return of the investments, is not likely to develop automatically the desired infrastructure as response to the market demand. The planning in the metalworking industry should take into account the following:

- a- realisation of the ready production, including the export.
- b- supply of raw materials.
- c- supply ancillary products.
- d- amount and distribution of investments.
- e- supply of labour force and training of the same.
- f- supply of energy.





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