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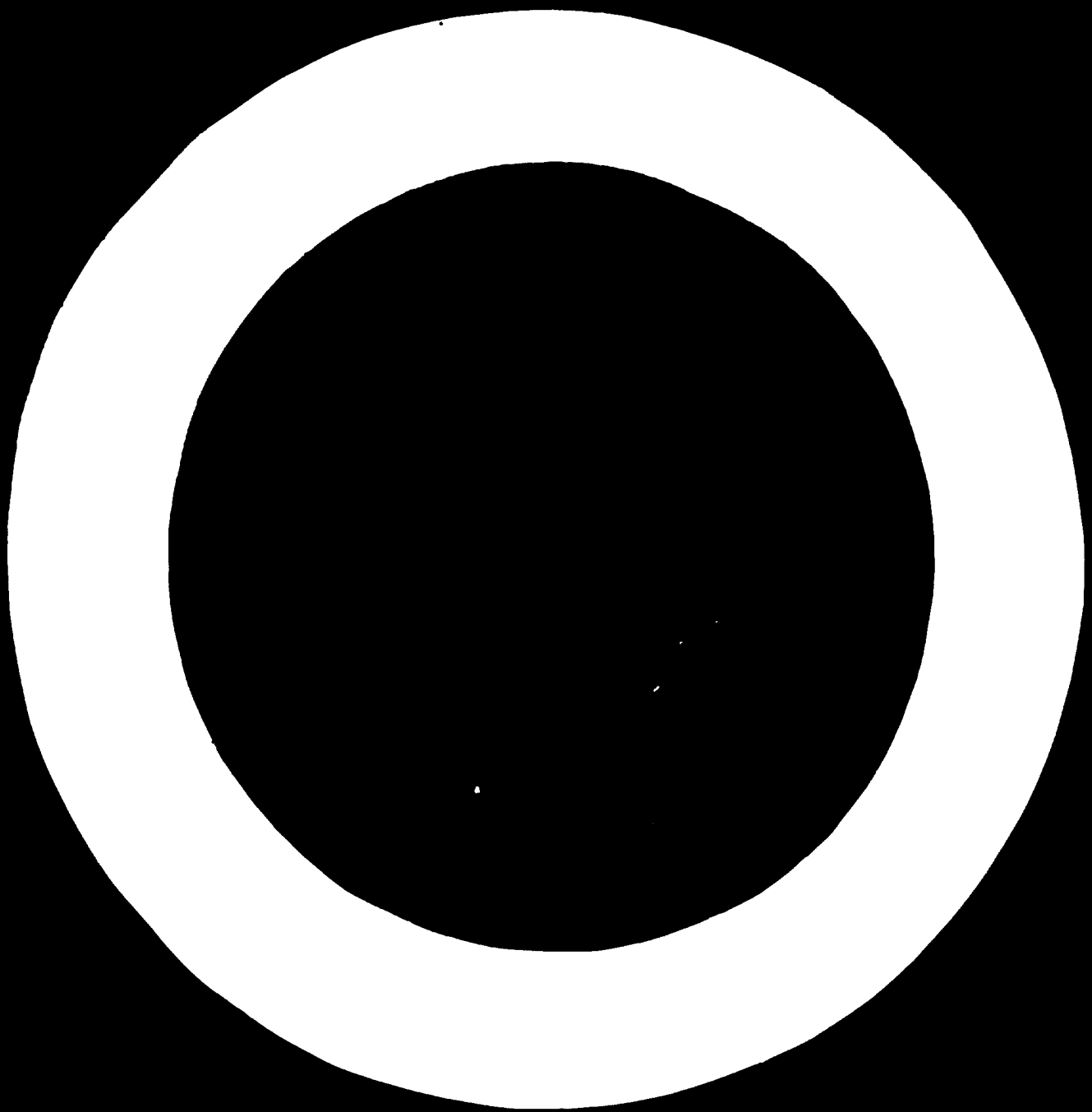
Development of Metalworking Industries in Developing Countries

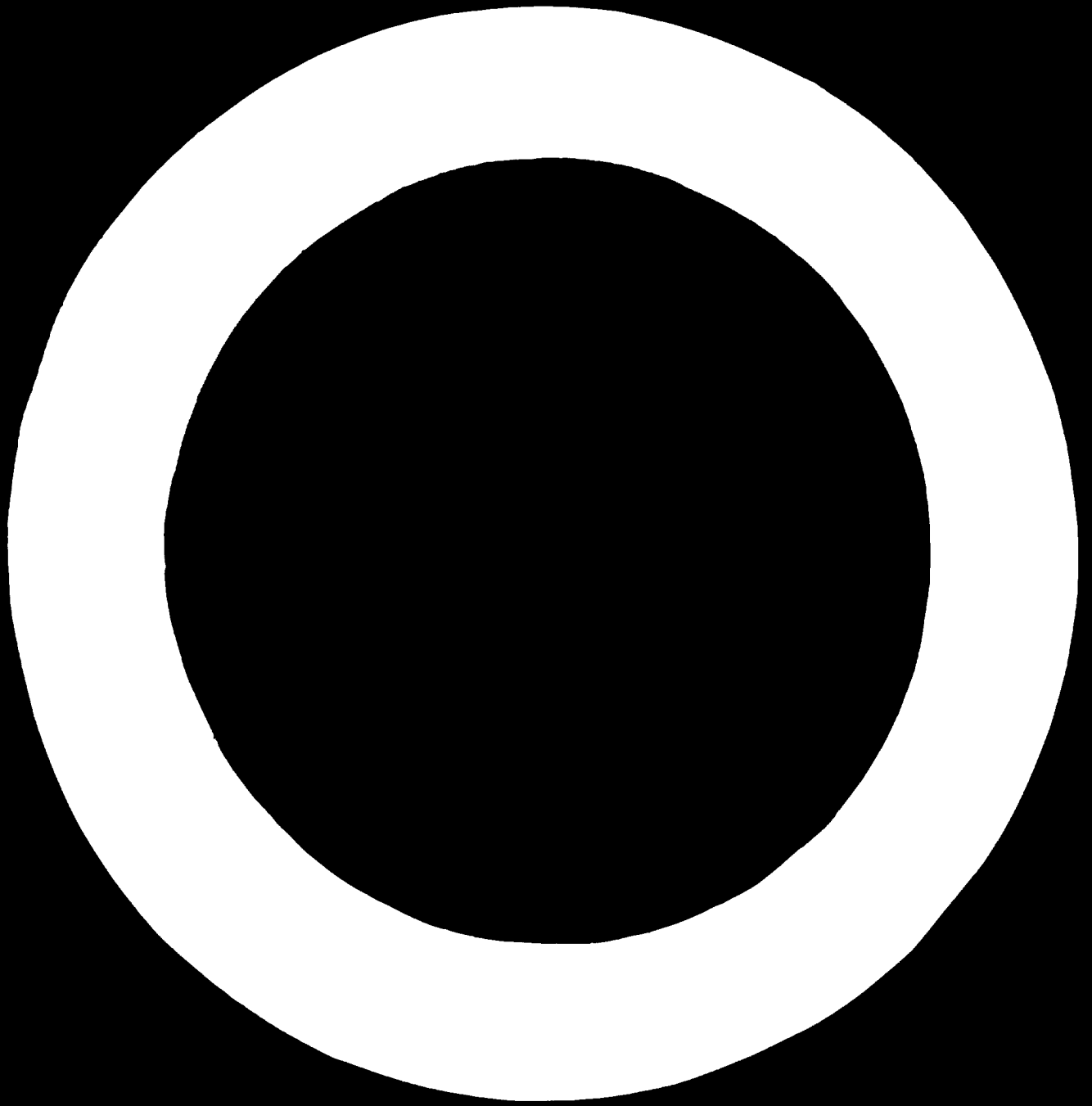
*Reports presented at the United Nations
Interregional Symposium, Moscow
7 September—6 October 1965*

Sales No.: E.60.II.B.2
IU/6



UNITED NATIONS
New York, 1969





THE MANUFACTURE OF MACHINE TOOLS IN ARGENTINA

Secretariat of the United Nations Economic Commission for Latin America

INTRODUCTION

Machine tools will play what might be termed an almost fundamental role in the industrial development plans in which Latin American countries are engaged. This is due as much to the greater production volumes it will be necessary to reach in the future as to the requirements of new production, since the continuation of the import substitution process must impinge primarily on products of increasingly greater complexity and productive requirements.

The increased rate of investment that these development programmes require and the limitations in the foreign purchasing power of these countries confronts the region's machine-tool industry with a serious responsibility: to meet qualitatively and quantitatively the demand which will arise within the next few years.

The manufacture of machine tools in Latin America is at the highest level in Argentina and Brazil as a logical consequence of the larger markets available in these countries. Nevertheless, this activity has in general developed in a disorderly manner and with an almost complete lack of orientation in regard to market size and the nature of demand. It reveals serious gaps in its production structure which place it in a difficult position to face the qualitative requirements of future consumption. This does not mean that the advances during this period lack meaning or significance for the future. On the contrary, the industry in these countries, supplying their markets with an appreciable portion of simple machines (more for maintenance than production), has completed an important stage in its development, thus establishing a base for a more advanced stage.

It is evident, however, that the activity has lacked that characteristic of dynamism and vitality which distinguishes it in the more advanced countries, in the sense of anticipating itself and foreseeing demand requirements. Lacking this dynamism, the industry will go on progressively losing its relative importance since, while demand for the machines that are being made will continue, it will be decreasing relatively within the total because of the greater requirements for more specialized and complex production machines.

These conditions influence the objectives in this study: to provide the framework within which the Argentine machine-tool industry should be developed in the next ten years by a quantitative and qualitative evaluation of the market and to analyse the operating conditions of the industry and to identify the structural changes required to follow forecast demand trends. The Banco Industrial de la República Argentina (BIRA), the Cámara de

Fabricantes de Máquinas-herramientas y Herramientas Afines, and the Consejo Nacional de Desarrollo (CONADE) contributed much to this study.

This report is limited principally to the machine-tool industry with regard to machine-tool construction itself, whether they be of the metal-cutting or metal-forming type and exclusively for working metals. The industries complementary to this activity, such as accessories and parts, have not been considered.

Owing to deficiencies in the basic statistics, it was necessary to make estimates to reconstruct the totality of the metal-transforming industries and their operating conditions in order to present a panorama of the machine-tool industry within the objectives of the study. Only when the data of the economic census become available will it be possible to know the real size of mechanical activities and the principal machine-tool consumers. Notwithstanding the preliminary character of this study, it is considered that the result of the research and the conclusions resulting from it concur sufficiently, in order of magnitude, with reality and that corrections in the future will not seriously affect the estimates made here, particularly in regard to the existing industry and the changes which should be introduced in it in the next few years. It should be remembered that the machine-tool field is particularly complex, with numerous and varied problems, which preclude the generalized application of laws or criteria or the attempt to transplant them from one region to another without encountering factors diverse and difficult to assess.

FUTURE MACHINE-TOOL REQUIREMENTS

The analysis of the machine-tool market until 1975 was carried out at the level of three large groups which show appreciable individual differences in the nature of the factors determining demand as well as in the characteristics of the required machines. These three groups were production machines, maintenance machines and replacement. In each group, the point of reference was the number and characteristics of machine tools on hand at the end of 1963. This had to be determined by special surveys at the national level: in the metal-transforming industries, the principal consumers of production machines, and in the remaining manufacturing activities, public services, the fiscal sector and various other activities with respect to maintenance machines.

It was established that in 1963 the national machine-tool sector accounted for 201,700 units, of which 173,100 were in production work and 28,600 in mechanical

maintenance and services. The production machine figures reveal an industrial structure in which small- and medium-size establishments predominate and, in consequence, they have small production series. This is corroborated by the high proportion of lathes, drills, shapers and saws, on the one hand, and the relatively low incidence of milling machines, grinding machines and tool grinders on the other. Likewise, it is shown that the machines are relatively new, since units less than ten years old are nearly 55 per cent of the total.

Maintenance machines, as was to be expected, show a high incidence of simple and universal units and a heavy predominance of machines more than ten years old which represent more than 65 per cent of the total.

Requirements of production machine tools were arrived at by a projection to 1975 of the value of the mechanical production as well as the personnel, translating the values in terms of machine tools. In this way, it was estimated that in 1975 the sector would total some 280,700 units, i.e., 74 per cent higher than in 1961, showing an average annual growth rate of 4.5 per cent as against the 5 per cent established for gross domestic product and 7 per cent for the metal-transforming industries.

In regard to maintenance machines, the first approximation was that the inventory would maintain the same proportion during this period in respect to the production inventory, raising the number of units in operation to 46,700 in 1975. Thus, the 1975 total for the inventory would reach 327,400 machine tools and the requirements would be some 125,700 units from 1961 to 1975, both years inclusive. The distribution would be 107,600 machines for production and 18,100 for services and maintenance.

Regarding replacement needs of the inventory, it has been conservatively estimated that only 20 per cent, some 15,600 of the 1963 machines more than ten years old, would be substituted by 1975.

In accordance with these predictions, it is concluded that the total machine-tool demand in the twelve-year period from 1964 to 1975 would reach 141,300 units, 76 per cent of which would arise from the metal-transforming industries, 13 per cent from the maintenance sector, and 11 per cent in replacements, the final percentage corresponding almost entirely to the metal-transforming industry.

THE MACHINE-TOOL INDUSTRY AT PRESENT

In order to obtain a more complete background of machine-tool manufacture, a survey of the country's manufacturers was undertaken by means of a personal visit to each establishment. As in other Latin American countries, this activity emerged in Argentina as a result of importation difficulties caused by the Second World War and showed a great expansion during the 1950's, achieving an annual production of almost 10,000 units. Later, and particularly until 1963, an appreciable reduction in manufacturing is evident as a consequence of the contraction of the domestic market. In that year, the activity had declined to where it was represented

by 86 manufacturers employing 1,700 persons, with a production of some 5,000 units weighing 5,000 tons.

This activity is located near the most dynamic industrial development centres of the country, which is the reason why nearly 70 per cent are found in the federal capital and the Province of Buenos Aires, the remainder being found in the Provinces of Santa Fe and Córdoba.

During the survey it was possible to prove that not all the enterprises were dedicated exclusively to the manufacture of machine tools and that several maintained other lines of mechanical production. Similarly, it was also proved that the manufacturers preferred to multiply their machine-tool production lines, building several different machines instead of exploiting the numerous variants which exist for a certain type and model of machine. Nevertheless, a certain tendency toward specialization can be seen: in metal-forming machines, for example, there exists a high percentage of enterprises whose production is restricted to machine tools and, within the sector as a whole, nearly 65 per cent of the establishments are dedicated exclusively to the manufacture of only one line of machines. In addition, approximately 55 per cent of the manufacturers contribute no less than 75 per cent of their annual output to the sector.

As to distribution by size of establishment, nearly 91 per cent have less than fifty employees and only three enterprises maintain a staff of more than 100, which is indicative of a structure little suited for the future development which this sector must confront in view of the general rise in demand for more complex machines. In this sense, this distribution would correspond rather to semi-artisan production than to an industry already established or in a growing stage.

The machine-tool inventory in the hands of manufacturers is about 2,000 units. It is relatively new, since 70 per cent of the machines are less than ten years old, and, taken together, offer a favourable composition with an adequate proportion of boring, gear and grinding machines and tool grinders. This situation, nevertheless, is strongly influenced by the larger firms which are equipped with complete assortments of efficient and good quality machines which enable them to manufacture more complex products.

The small enterprises do not have a very complete inventory and subcontract specialized machining services, with the aggravating factor of lacking adequate means for quality control of products farmed out.

During the visits, it was also evident in almost all cases that the good quality of the labour force, often of very limited resources, overcame to a fair extent some of the machining complexities.

Production figures which were possible to reconstruct since 1957 reveal that at that time the national industry had already achieved a significant manufacturing volume, showing a slight tendency toward growth until 1961 when it registered production of 11,492 machines weighing 10,537 tons. Since then, owing to the deterioration of the country's general economic conditions, production fell violently, and in 1963 only 4,767 machines weighing 4,714 tons were manufactured. The cumulative total during this period exceeded 64,000 units weighing

more than 55,000 tons. This effort has been a determining factor accounting for the national inventory's maintaining 55 per cent of the machines of less than ten years of age in the metal-working industries.

The products which the industry put on the market have filled an important role in meeting domestic demand, especially in respect of simple and light machines with limited resources and of low unit price. Nevertheless, it should be pointed out that during the passage of these years a certain number of machine tools have made important progress and today show high quality and technological standards, which place them in a very favourable position regarding domestic demand as well as for entry into international markets.

It is interesting to note that during this lapse of time national production displayed activity and speed enough to attend to the most elemental requirements of the market. The average unit weight of machines showed a 32 per cent increase in the metal-cutting category, reaching an average of 644 kilogrammes per machine in 1963. Metal-forming machines have maintained an average unit weight of slightly more than three tons. Similarly, it is possible to see in the composition of manufactured machines a certain trend that is in agreement with expectations for the structure of the future machine-tool inventory: relatively lower production of lathes, drilling machines and shapers, and higher production of milling, boring, threading, grinding and metal-forming machines. Although just beginning, this tendency should increase over the next few years and it is now the task of the sector to consolidate its position by means of more developed machines. This is necessary because staying in the present production line would seriously affect its taking part in meeting domestic demand which, according to predictions, will become steadily more difficult in terms of the complexity and quality of machines.

In regard to the prices of national machines, it is difficult to establish the true level for the various manufactured products in the year of the survey and arrive at any opinions in respect to their competitive position in the international market, even though this by itself is not the decisive reason for determining export possibilities for this type of product. Nevertheless, exports registered in 1962 and particularly in 1963 appear to indicate that the price levels at those times were acceptable in certain foreign markets.

POSSIBILITIES OF THE NATIONAL INDUSTRY IN THE FUTURE: MACHINE-TOOL MARKET

In broad terms, it can be said that local machine-tool manufacture contributed almost 85 per cent of the number of machines which were incorporated into inventory in the ten-year period of 1954 to 1963. Regarding weight, the national share fell to 59 per cent and even more if the value is taken into consideration. This came to only 45 per cent. These figures sum up clearly the role which national industry has played in supplying the market and at the same time reveals in a general way a difficulty in keeping up with the increasing technological

requirements of demand, national as well as export. It is then evident that the future possibilities of the industry will be closely linked to the changes which must take place in its productive structure and technical potential. These aspects, although not the only ones, acquire especial importance in this stage of the industry's development. An analysis in this sense, based exclusively on past experience of its evolutionary process, would at this time be totally unrealistic. The most determinant aspects for the development of the sector are principally related to perfecting the machines now being manufactured and starting to make new types of machines. For this, it will be necessary to face a reorganization of the small industries, raise the technological level, establish adequate lines of credit and financing and, finally, create an Argentine Machine-Tool Institute which, among other functions, would give drive to and support the development of the activity.

The recommendations and the specific manufacturing programme which have been outlined would not in themselves constitute too ambitious a goal or a task too difficult to accomplish if viewed from the standpoint of time and the number of enterprises which could participate. These, including enterprises now in operation, plus others which will eventually join them, come to around 120 firms. The programme certainly implies important technical responsibilities which in order to be achieved will require great effort on the part of the manufacturers, a fact which could be interpreted as an obstacle to success. Nevertheless, if one takes into account the level reached by national industry, the productive elements with which it is equipped and the quality of workmanship employed and which can be made available, the technical aspect is not to be considered as a limiting or unsalvageable factor. This is especially true when one considers that the possibilities of success will to a great extent depend on the facilities accorded to the sector and the adoption of a stable and well defined promotion policy on the part of the government agencies and, also, on the measures taken within the sector itself to adapt its productive structure to the conditions demanded by the programme.

Once the recommendations and the programme outlined have been carried out (which in practice correspond to increasing the unit weight of the machines and their average value per kilogramme), it is expected that local industry will be able to increase its share of consumption to 65 per cent in weight and 56 per cent in value, its percentage contribution remaining more or less constant in relation to the number of machines. It is also considered that improvement in future production along the lines pointed out would place the industry in an even more favourable export position than that seen until now, and it is foreseen that in the first period to 1970 there will be exports of some 2,000 tons annually, which will rise to about 4,000 tons by 1975. In this way, national production in 1970 should reach 13,500 tons and, in 1975, 22,000 tons. That is, 28 and 110 per cent higher, respectively, than the highest figure achieved in 1961.

To accomplish these goals, the personnel required should rise to 6,900 persons in 1975, that is, almost four times higher than the 1963 work force. A great deal of

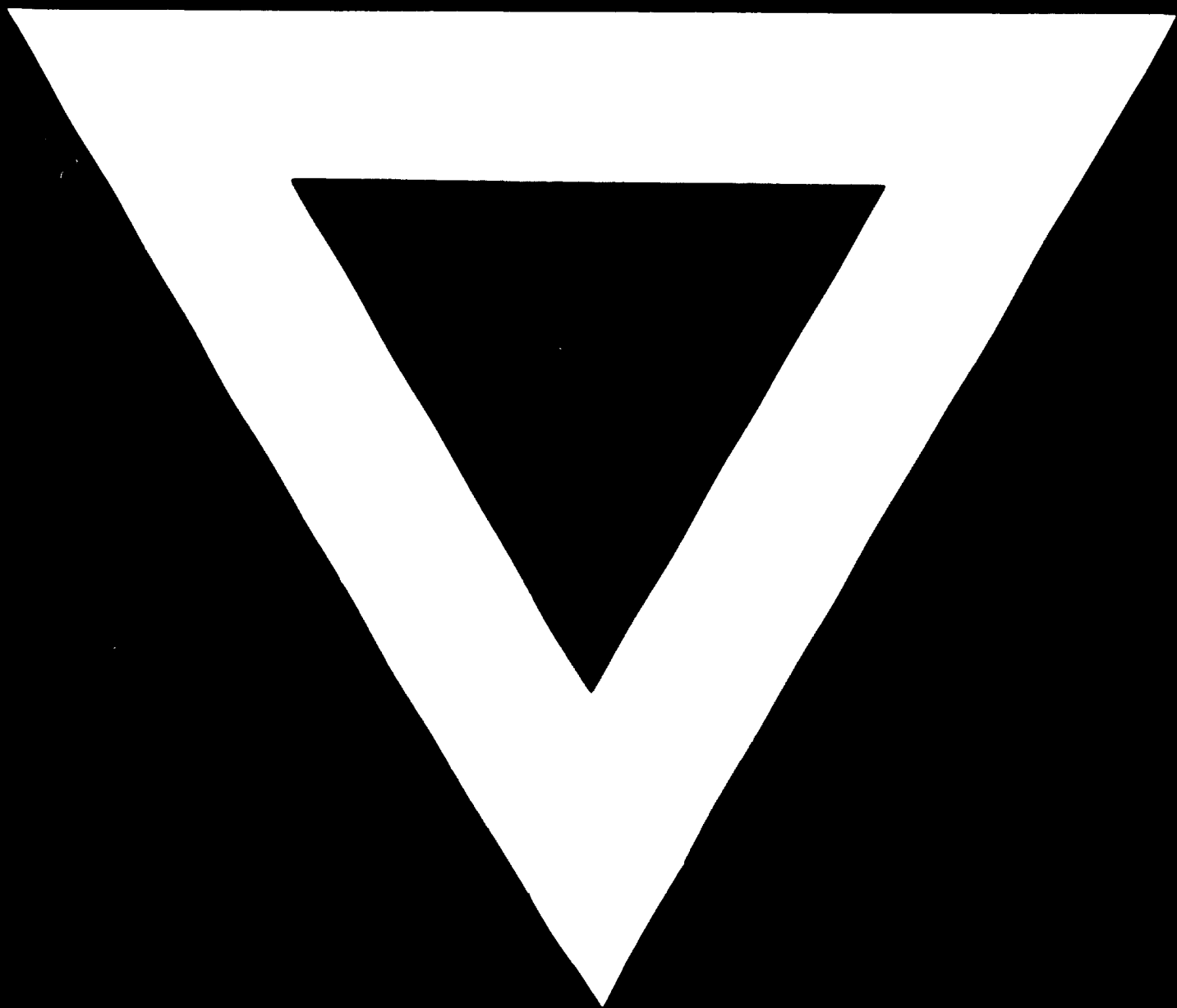
this increase corresponds to the greater need of indirect personnel to achieve higher productivity, the construction of new models, improving average quality and the manufacture of more technically complex machines. The investment required should come to about \$14,350,000, principally for the construction of prototypes of new machine models and for the acquisition of machine tools, both imported and national, to complement the manufacturers' present inventory.

Finally, there is the fundamental role which should be played in the execution of the programme and future development of this activity by an Argentine Machine-Tool Institute dedicated to the study and research of techniques related to the construction and functioning of machine tools. Getting this institute started would bring important benefits to the makers as well as to the users of the machines. For the former, it would help in meeting technical manufacturing requirements and, for the latter,

the quality tests carried out by the institute would constitute a guarantee for manufacturing and bring more prestige to products for either the domestic or export market. Aside from the mainly technical functions which would be carried out by the institute, it is also thought that it should actively participate in the orientation of the development of this activity, advising the competent agencies regarding credit which should be given to manufacturers for the acquisition of machinery and production equipment as well as for the study and building of prototypes.

In view of the range of the programme, as well as the effort that must be exerted in order to achieve the goals it contemplates, it is necessary as soon as possible to adopt the measures outlined so that this activity may have an evolution which accompanies and, in a sense, anticipates the needs which will stem from the development of the country's metal-working industries.





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