OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

FAIR USE POLICY

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

CONTENTS :

- FOREWORD
- PRODUCT (TYPOLOGY)
- Choice of Class of Machine
- Practical Example

- QUANTITY
- Choice of a Specific Type of Machine
- Practical Examples

- MACHINE CHARACTERISTICS
- Choice of a Specific Machine Model
- Conclusion

FOREWORD

The subject that we intend to analyze is of fundamental importance. The present situation in industry, artisan concerns, and the many different kinds of activity that gravitate around this sector, calls for special attention and for critical and objective examination.

Today, manufacturers bear a heavy responsibility for the choice of machines offered. Indeed, a number of client firms have had very unfortunate experiences, involving them in heavy expenditure and the failure to achieve their purpose.
The object of this meeting is to analyze the criteria to be applied in choosing machinery, in the hope of preventing the recurrence of such experiences.

The vastness of the subject is such that we are forced to keep it within bounds; however, we shall try to bring out the technical aspects that we feel to be more important and, if time allows, shall be glad to discuss the various details with reference to specific examples. We have thought it a good idea to present the various subjects in schematic form, both to leave them open to individual interpretation, and because a long description would probably have been monotonous and too general.

Before examining the various reasons that lead to the choice of production equipment in general, some points of an overall nature have to be made.

The various choices are normally dictated by the examination and analysis of a group of rational — and not emotional — considerations. There is always a logical process of choice, based on a series of reasons of a technical and financial nature, which must be identified and classified in order of importance, to get the requirements of the machines in clearer perspective.

The technical reasons are the ones that we propose to examine with most attention. But before doing this, some general remarks of a financial nature need to be made.

The design and planning of industrial plant or of any production line call for the examination of many different factors that have to be structured together, to yield a technically workable whole that will fulfil the purpose for which it was intended, and is financially sound.

There are many machines available that, from the technological point of view, can meet the requirements imposed by a problem; the right one has therefore to be chosen on the basis of financial considerations that must, of necessity, be taken into account, to avoid opting for brilliant technical solutions that would, however, be too expensive. Investment, in this case, is seen as a balance, over a period of time, between immediate expenditure on production equipment (machinery) and the future profits to be made out of operating a plant where costs have already been determined.

PRODUCT (TYPOLOGY)

Choice of Class of Machine

In considering the construction of a production plant, or at any rate the purchase of machinery, the following questions require to be answered:

- What to produce
- In what quantity
- In how much time
- By what means
- At what place

It follows that the point of departure is the qualitative and quantitative identification of the product (or goods), which can be determined by analyzing the markets that offer themselves and the quantities that can be sold at various prices, depending on conditions of marketability (distribution networks, competition).

Knowledge of these factors is fundamental for the definition of:

a) The typology of the product (and its basic characteristics).

b) The quantity actually produced in a suitably chosen unit of time.

c) The quality, which must coincide with the requirements of a given type of market.

Of these three factors, the most important one, and the one that has the closest bearing on the initial choice of machinery, is undoubtedly the first one, that is:

The typology of the product.

In order better to understand the effect that the product may have on the initial choice of machinery, it is perhaps worth dwelling for a moment on that product, viewing it as a combination of so many components, with different dimensions, geometrical shapes and cross-sections, assembled in accordance with certain logical criteria.
All these components require to be worked on machines that, given their basic concept, their form, their technical components, their machining capacity etc., will be able, as rationally as possible, to meet the requirements essential to manufacture of the parts.

The essential need is that of having a machine with special characteristics, able to produce, in the best possible way (and in the best conditions) this or that particular type of product.

The technology of conventional wood-working processes provides for a series of processes or operations, designed to modify the shape, dimensions, and degree of finish of a piece of wood, by removing from it a layer of material that becomes a shaving, with the aid of the appropriate machine tools.

If we consider the classic wood-working product, which is the door or window, the various processes may be classified, generally speaking, as follows:

1) Basic cutting
2) Length-cutting or sectioning
3) Profiling or shaping
4) Tenonning, or joining

5) Gluing

6) Assembly

7) Gauging or sanding

8) External profiling or squaring up

9) Slotting for metal fixtures etc.

10) Assembly of metal fixtures, wiring covers etc.

11) Painting

Seeing that the product, due to its constructional requirements, gives rise to a series of working or machining steps, in a certain chronological order, the necessary means of production can be selected accordingly, since for each specific process there is a machine with more or less appropriate characteristics.

To sum up, in wood-working, in view of the variety of geometrical shapes needed, it is of prime importance to establish the working steps required by a particular product, in order to identify clearly the most suitable machine for the job.

In this way, it will be possible to select and decide on the various classes of machine needed, which may be the following: Cutting-off machines, length-cutting machines, profiling machines, tenoning machines, squaring-up machines etc. etc.

Practical example: . . . . . .

. . . . . Separate folder . . . . . .

QUANTITY OF PRODUCTION

Choice of Specific Type of Machine

After having identified the class of machine needed for producing the product, the second choice generally depends on the quantity to be produced. We refer to quantity, however much it may be, taking it for granted that a high-class product is to be produced; that is, large quantity does not necessarily mean poor quality: on the contrary, the greater the quantity, the more likely it is that machines with a high productive capacity will be chosen, with specific functions that can give the best guarantee of their ability to repeat mass-production processes, and that can turn out the best-quality product from the point of view of size and finish.

The greater the quantity to be produced, the more the machine will have to satisfy the need for repeated, automatic production.

The more a product calls for precision and quality, the more the characteristics of the machine will have to fulfil the requirements of dimensional precision.

In view of these requirements, the automatic machines used will have to be sufficiently reliable and accurate to enable us to meet the above demands.

The choice will therefore fall on a given type of (automatic) machine, because the quantity to be produced is big enough to require its use, and because that quantity is the determining factor in the case in question.

When the quantity to be produced is much smaller, the machines needed, although they may have many characteristics in common with the automatic machines, may be semi-automatic or manual — that is, while keeping up the same standard, qualitatively speaking, they will be less productive.

Generally speaking, in large industries, where the quantity required is very big, production technology calls for automatic machinery with a very high performance and a specific function. The artisan, on the other hand, for his small-scale operation, generally tends not to specialize in one type of product, but to meet general needs. Consequently, the machines that he needs will have to be extremely versatile.

Since such machines are suitable for more general purposes, they will not be able to turn out the same quantities as automatic machines, but they will be able to perform a whole series of more varied operations.

To sum up what has so far been said, in the interests of clarity, we can say the following:

Basically, two types of machine are required:

The first type, is designed for large-scale production, with a specific function; obviously, since this machine is intended for a single type of process, it will have to be capable of very high rates of mass-production.

The other type of machine, on the other hand, is designed for medium, and small-scale production. Here, the most important

thing is versatility. Obviously, the versatility of a machine, due to its different constructional concept, means that it cannot have the performance of the previous type of machine.

In this way, we can identify the various types of machine, as a function, obviously, of the quantity to be produced.

Practical Example: . . . . . .

. . . . . Separate folder . . . . . .

The processes that we listed just now should not be taken as permanent factors — that is, they are not always the same. A profiling job, for example, may be done on a profile that is not necessarily straight, and may even be curved; thus, automatic machines are not very suitable for the job, given their structure; it will therefore be necessary to work the piece on a simple or manual machine, whose very simplicity will make it more versatile and suitable. The typology of the piece to be produced is therefore decisive at this point, and even if the quantity concerned is a large one, it will always be more satisfactory to do the job on a series of manual or conventional machines , rather than on an automatic one.

It therefore happens that certain details, although they are the same as those produced on automatic machines, do not keep their classic form, but take on different characteristics due to their geometrical shape or specific peculiarities. They are therefore outside the sphere of normal working — that is, with automatic machines — and, in their turn, also

create small or large quantities of production. In such a case, it may be more satisfactory to use one or more conventional and manual machines, leaving it to the operative to compensate for their limitations.

If, however, the quantities are very large, the choice may fall on a special machine, constructed, that is, for that specific process.
Practical example: . . . . . .
. . . . . Separate folder . . . . . .

In a production cycle, it is extremely important that each individual component should be in proportion to the whole. It may happen, however, that this balance has not been struck, and therefore the various operations will not be harmonized or controlled, with the result that operating costs and time are not kept down to the minimum. Indeed, one type of process may produce a degree of automation that, if compared to another, may be more or less balanced, although both the machines are automatic. This happens because the specific characteristics of the two processes are in practice too different, with the consequence that the two machines give a different performance.

A machine never performs a complete production cycle (except in a few cases), but one or more steps. We shall therefore always find a series of machines arranged in accordance with a certain logic, in which each machine has to produce in the right measure. So it is up to us to choose our machines, assigning the correct value to each. Practical example:. . . .
. . . . . .Separate folder . . . . . .

MACHINE CHARACTERISTICS

Choice of a Specific Machine Model

Having chosen the right class and right type of machine is not enough, since, if our choice were to stop here, we might buy all the machines available on the market. The two choices may be considered as a function of each other, closely connected and complementary. A given model of machine is chosen from among many of the same type.
That specific type of machine is chosen from among many of the same class.

We are therefore confronted with the final choice, which finally decides our purchase, and any possibilities of error should therefore be avoided as far as possible.
The class and type of machine required can always be identified with a fair degree of precision; but, after that, we have the possibility of choosing from a vast range of models or brands, which are substantially different in many of their characteristics. The most important of which are as follows:

Reliability:
The degree of reliability of a machine expresses its ability to remain efficient in the course of service; that is, it expresses the probability that it will operate efficiently in pre-established working conditions. It must be ready to work efficiently for the desired time, in the sense that it gives, in that space of time, the qualitative and quantitative performance required, without any interruptions.

Versatility:

Given the same conditions, a machine may be more versatile than another, inasmuch as it can be used for various processes.

Ease of operation:

This consists in the ease with which the machine can be set up between one process and another; changes should be able to be made in the machine in as short a time as possible.

Profitability:

This should be taken as meaning more precision for subsequent operations, less consumption of energy, compressed air, less maintenance, less labour, fewer tools and raw materials, shorter feed times and unloading of work pieces.

Precision:

A correct dimensioning of the machine in all its mechanical parts involves balanced performance of work and, obviously, optimal precision — which, however, remains conditioned by the state of the tool.

Strength of construction:

The machine has to be sufficiently solid and heavy to ensure a total absence of vibration or resonance during working, and to ensure the good quality of the product.

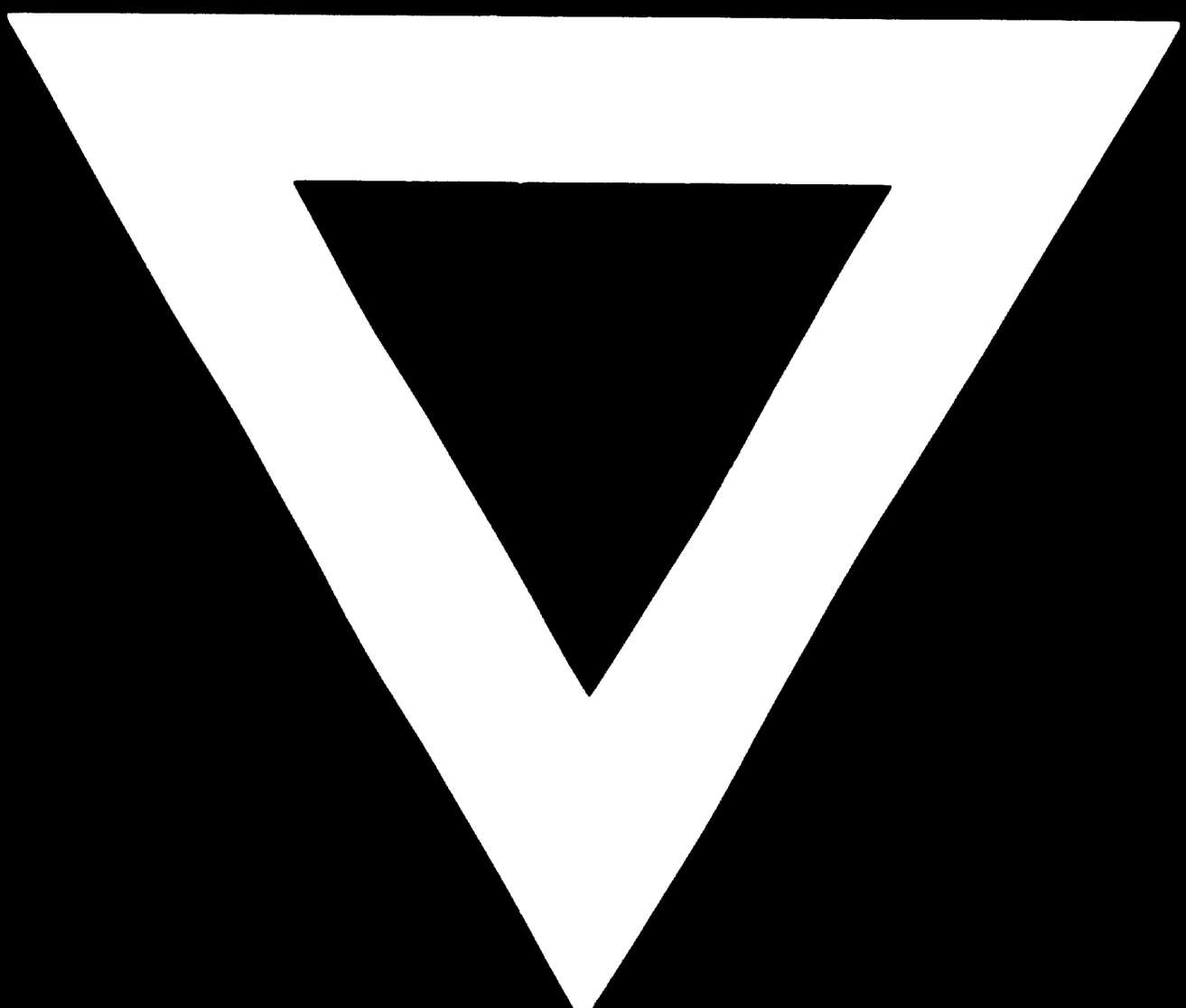
Post-sale service by manufacturer:

Constant servicing of the machines sold is of fundamental importance. The manufacturer must take the trouble to find out customers' needs, and consequently be able to offer them

"product-service", in which the product is represented by the activity of the firm, which guarantees its modern construction method, while the service is represented by highly efficient assistance. In other words, there should be both pre-sales and post-sales service, for co-operation with the customer begins long before the sale of the machine, and continues long after that sale has taken place.
All these attributes determine the validity of the machine, and if cultivated with sufficient care, will lead to the choice of the ideal machine: the very one that is needed. Its price is undoubtedly important, but not always a determining factor, since it may be relatively insignificant as long as the machine fulfils the requirements already mentioned. A final note is addressed to those who purchase machinery: their competence in the specific sector concerned is very important, for knowledge of the real nature of wood makes it possible to operate with it under the best conditions, to foresee when it is likely to become deformed, and not to find out too late.

The study of wood-working processes, using machine-tools, goes hand in hand with their use. This must be the subject of particular attention, especially when applied to actual production. It is only at this point that we find the effectiveness of technological research, which, without the proper basis, remains abstract and without motivation.
The fine works performed in wood throughout the centuries are very many: they stress and confirm the importance of wood in the life of man and the lively spirit of which he has given proof.

B-268



77.06.28