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The techniques involved are:

- job rotation
- job enlargement
- job enrichment
- group work

Mention was made above of experiments being carried out because not all work study groups are agreed as to the real benefits deriving from this development.

It is a curious fact that in the artisan type of firm, whose numbers are unfortunately decreasing, these techniques have always been used.

The advisability or otherwise of going further into the matter, according to present or future circumstances, is left to the reader. The matter has been referred to here because of its pertinence to the subject under review and the influence it can have in determining production facilities.

6. Layout

In drawing up a processing layout, consideration must be given to the breakdown of the product into assemblies, sub-assemblies and piece parts, to co-ordinate them into the various manufacturing cycles, making them converge into a common flow diagram which produces the layout with its relative infrastructures. It is at this stage that much can be done to obtain optimization in the use of the machines available. Therefore the drawing up of a layout is of the utmost importance and must take into consideration the points (a-b-c-d) mentioned under A.2 (The product). It is on these points, above all, that the choice depends i.e. whether

- fixed layout
- processing layout (areas with homogeneous machines)
- product layout (machines arranged sequentially according to the manufacturing cycle)
- mixed layout (in which the requirements of the processing and product layouts are taken into account simultaneously).

A hypothesis worth considering, where practicable and convenient, is to build up the layout flexibly by shifting the production equipment from time to time in the sequence most suitable for production flow. Both horizontal and vertical handling outside the machine must always be carefully considered, as well as the direction of flow which should always be positive.

In addition to the correct location of machines, the subject of layout involves the suitable location of the various production departments, stores, buffer stock areas, auxiliary facilities and therefore of installations which are concerned with the layout and availability of machines. (These subjects will also be dealt with in specialized reports included in the programme of this seminar).

7. Machine Features

After having mentioned the context in which the machine will be inserted, we may now examine the machine's specific evaluations which imply judgement of its merits as to essential content and competition with similar types or substitutes offered on the market.

Considering machines in a general schematic way, they can be sub-divided as follows according to number of tools and therefore number of operations:

- single purpose (for single operations)
- multi-purpose (for multiple operations with movement of tools or of parts being machined in transfer).

According to the intervention of an operator they can be:

- manual
- semiautomatic
- automatic
- numerically controlled.

With the variety of machines available there will be no lack of interesting examples in the reports which follow, but the principal features distinguishing the most sophisticated are:

- reduction of direct labour costs
- reduction of tooling costs
- increase in production
- improvement in product quality
- reduction of rejects
- certainty of achieving planned machining times
- possibility of entrusting to one or more persons the task of minding more than one machine simultaneously
- reduction of floor space required

The desire to acquire machines having these features must not cause the following considerations to be overlooked:

- high purchasing cost (investment)
- possibility of high utilization ($\frac{\text{available hours}}{\text{actual hours}}$)
- technical up-dating with reflection of premature obsolescence
- complexity with its influence on maintenance and servicing
- tooling up times
- times, costs and practical possibilities for programme preparation for NC machines
- possibility of obtaining special tools and essential mechanical and electronic spare parts even after a reasonable lapse of time.

It must be emphasized that the economic values involved make these machines convenient when they are used intensively (even on three shifts). Therefore the purchase of a machine which is not fully exploited, or left inactive, is to be deprecated.

To explain the "fundamental purchasing components" mentioned in the foreword i.e.:

- 1) TECHNICAL PRODUCTIVE
- 2) ECONOMIC
- 3) COMMERCIAL

an attempt is made hereunder to group the most significant arguments contributing to the formation of these components.

Some of these arguments are given placings either multiple or apparently inappropriate according to the classification adopted. But, rather than a sterile perfectionism, the preference has been for a pragmatic description of the main concepts to which the attention may be directed for the required judgement of their merits before deciding to purchase; stress being laid on any which are worthy of attention.

7.1. TECHNICAL-PRODUCTIVE COMPONENT

7.1.1. Hygiene and safety

7.1.2. Accident prevention:

accident sources statistics, while including some collateral causes and incidental factors (2%), consist almost entirely of two: human factor (88%)
technical factor (10%).

Without doubt wood working machines may be considered among the most dangerous, for the distracted or unskilled operator, especially if not provided with all the technically feasible safety measures. All machine producing countries have strict and precise safety regulations and machines must be sold in conformity with them.

7.1.3. Noise:

unfortunately nearly all wood working machines have a high noise level.

Noise assumes an important role in factory life due to its social and economic implications.

It is a considerable burden and much is done to reduce it at source (on the machine itself) and to reduce its transmission by insulating the machine and the environment with sound deadening material. Its effect on operators is also limited by means of suitable personal protective measures, with turnover etc.

It is therefore very important to take this factor into consideration in the choice of machinery.

7.1.4. Vibration:

this is dangerous to human beings, makes accurate work difficult to achieve and leads to many failures in machines and environmental structures. Machines must be provided with suitable damping where necessary.

7.1.5. Protection against dust, chips, smoke, vapours, humidity and their automatic evacuation.

all machines must be provided with means for connecting up to a general network.

7.1.6. Visibility and illumination of the working zone and practicability.

7.1.7. Machine body designed to eliminate or minimize dangerous projecting parts and sharp edges.

7.1.8. Ergonomics of man-machine combination and physiological and functional chromatism, as regards main colour and that of particular parts, for easy and instinctive access to functions (controls, electrical and hydraulic equipment, working zone etc.).

7.2. Toolings

7.2.1. Incidence of cost for special tools.

7.2.2. Incidence of down times for tooling.

7.3. Maintenance

7.3.1. Maintenance aptitude.

ease of maintenance, such as access to parts liable to failure, and possibility of easy handling of tools for rapid repairs.

7.3.2. Standardization of components and spare parts and their long term availability.

The high cost of machinery does not permit the installation of stand-bys and therefore the above-mentioned coefficient must be kept high:

$$\frac{\text{available hours}}{\text{actual hours}}$$

A failure does not only involve the burden resulting from the repair and/or maintenance operation, but also costs involved in production losses during the failure, of re-starting the machine, and of any defective production before settling down again to normal running. If it is also considered that, in some cases, annual maintenance costs are over 8% of the capital invested, the importance of this parameter can immediately be appreciated.

7.4. Reliability and Efficiency

When it is considered that breakdowns can derive from:

- a) design or be inherent (responsibility of the designer)
- b) manufacture (responsibility of the manufacturer)
- c) operation (responsibility of the user and influenced by operating conditions and preventive maintenance),

it is necessary to make sure, as far as possible, of long term reliability and efficiency in addition to the testing by which the performance is judged on delivery.

The reliability of a machine defines the probability of it being able to function without breakdowns for a certain number of hours under certain pre-established operative conditions.

The ratio between the average time interval between two breakdowns (T), and T plus the average duration of a breakdown (P), represents Efficiency (or Availability) i.e. the percentage of time during which the machine should function without breakdowns ($E = \frac{T}{T+P}$).

Unfortunately these values and the relative technical-commercial guarantees, very important for the evaluation of costly and complex machines, are still difficult to obtain from manufacturers who have only recently begun to collect the statistical data involved.

7.5 Automation

- Use of reliable automatic devices for loading, clamping
- Application of automatic loading and unloading (robot or transfer)
- Applicability of unit heads permitting a more universal use.

Due to the important function of certain automatism which could interrupt an entire production process when becoming defective it is advisable to be generous in their application to avoid damages from hold ups in production which could prove far more burdensome than the cost of stand-by devices.

7.6. Technological features

- Overall dimensions of the machine
- Machine weight, useful for judging stability and fatigue resistance
- Quality of materials used and their metallurgical treatment
- Characteristics of electric motors relative to power supply available and loads foreseen. Their intrinsic quality also regarding hermetic sealing, cooling, etc.

- Dimensioning of moving parts or those more subject to stress (shafts, bearings, bushes, gears etc.) and their accurate lubrication and cooling.
- Adequate supply of control instruments both for production and correct working of the various machine members.
- For NC machines, programmes and their management.

7.7. Technological capacity

This is specific for the operations involved. It defines operative capability (quantity and quality) of the machine for the material being used, the involvement being: forming (presses), stock removal (sawing machines, planes etc.), coating (spreaders, automatic roller painters, sprayers etc.) i.e. any modification to the state of the workpiece between input and output.

Among particular characteristics, operational speed and working tolerances should be underlined.

8. ECONOMIC COMPONENT

8.1. Investment

- Machine purchase price plus charges for transport, customs, insurance etc.
- Obsolescence prospects (residual value).
- Problems concerning machine base, foundations, servitude etc.
- Floor space and height.
- Cost of NC unit.
- Optionals
- Cost of connections and/or preparation of infrastructures (electric, hydraulic, pneumatic systems etc.).

- Expenses involved in any modification to existing systems and moving of other machines and equipment.
- Testing and commissioning costs.
- Costs for training of personnel.
- Depreciation indexes (real and fiscal)

8.2. Management

- Operational or running costs (direct and indirect labour, breakdown costs etc.).
- Qualifications of personnel and pertinent remuneration.
- Consumption of energy for a given production.
- Facility of loading and unloading workpieces.
- Operational flexibility: max. and min. dimensions of workpiece.
- Reject coefficient.
- Characteristics of waste and losses due to scrap.
- Cost of floor space occupied.

9. COMMERCIAL COMPONENT

Elements for commercial negotiations are fully dealt with in "General Conditions for Supply and Export of Materials and Equipment" established by the European Economic Commission of U.N.O. (Encl.)

The following may be considered as complementary to these conditions:

9.1. Quotation request

It is always advisable to ask for the characteristics of the supply and its price by means of a formal "Quotation request" which, attached to the "Quotation", the "Purchase order", the "Order acknowledgement" and the illustrations (leaflets, drawings etc.) referred to, constitute technical,

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economic and legal documentation of the supply.

In periods of price increase, like the present, quotations should include validity and indicate formulas for possible price escalation.

9.2. Customs tariff no.

It is advisable to give a precise description (also for customs purposes) of the machine required.

In this regard several countries are working on the unification of the terminology defining all wood working machines. One such unification in a fairly advanced state is EUMOBOIS.

9.3. Specifications

The quotation request should include the technical specifications to which the machines intended to be purchased should conform. These specifications should be drawn up by the purchaser or he should refer to well known specifications (e.g. SCHLESINGER, STANIMUC, NAS for NC machines).

9.4. Documentation

According to the complexity of the supply, adequate documentation should be included in the most suitable language and comprise:

- installation layouts
- wiring diagrams
- operating manuals
- maintenance manuals
- programming manuals for NC
- illustrated list of spare parts
- revision cards

9.5. Delivery

Two important points are the compliance with delivery dates and the penalties applicable for late delivery.

9.6. Payments

Many forms of payment may be stipulated between the parties.

BLOCK DIAGRAM ILLUSTRATING
WOOD PROCESSING OPERATIONS

	OPERATIONS	PRODUCTION FACILITIES	PRODUCTS
LOG	physical-chemical treatment	{ tanks autoclaves driers etc.	{ chemicals wood pulps etc
	mechanical processing	{ slicing machine peeling machine saw planer molding machine boring machine etc.	{ planks veneer (sliced) veneer (peeled) etc.
	glueing	{ presses cold or hot clamps	{ plywood block boards chipboards fibreboards
	surface finishing	{ sanding machines printing machines automatic roller painters sprayers driers etc.	{ furniture door and window frames carpentry etc.

TYPICAL PROGRESS OF WEAR RATE
DURING THE LIFE TIME OF A MACHINE

no. of breakdowns	time		
	1st period	2nd period	3rd period

1st period: called "infant mortality".

Characterized by a fairly high breakdown rate which rapidly decreases (mainly manufacturing faults).

2nd period: called "useful life"

Characterized by a constant breakdown rate. Breakdowns occur casually independently of the life of the machine.

3rd period: called "old age"

Characterized by an increasing breakdown rate due to age.

DIAGRAM ANALYSING A HYPOTHESIS OF MEDIUM SIZED INDUSTRIES

raw material stores
general stores
finished product stores
engineering and contracts dept.
personnel office
production office
mechanical shop
press shop
paint shop
packing dept.
dispatch dept.
tool and maintenance depts.
machine maintenance dept.
general maintenance dept.

importance of relationship

- A important
- B medium importance
- C indifferent
- D to be avoided

MACHINE LAYOUT STUDY SCHEDULE

Description	Services	Location		
		Factory	Floor	Bay
Machine	Main motor			
Make	..... V phase			
Model	..... Hz ... HP			
Cat. no.	..... rpm			
Capacity	Control gear			
Tool list	.... V AC - DC			
Inventory no.	Intake Gas			
Drawing no.	Water Coolant			
Changes	Outlet			
	Steam			
Cost ..	Date ...	Condition		
		Foundation Yes No		
Length ..	Width ..	Drawing no.	Scale 1:50	
Height ..	Weight ..	Grouting	Notes	
Special features ..		Anchor bolts		
		Dampers		

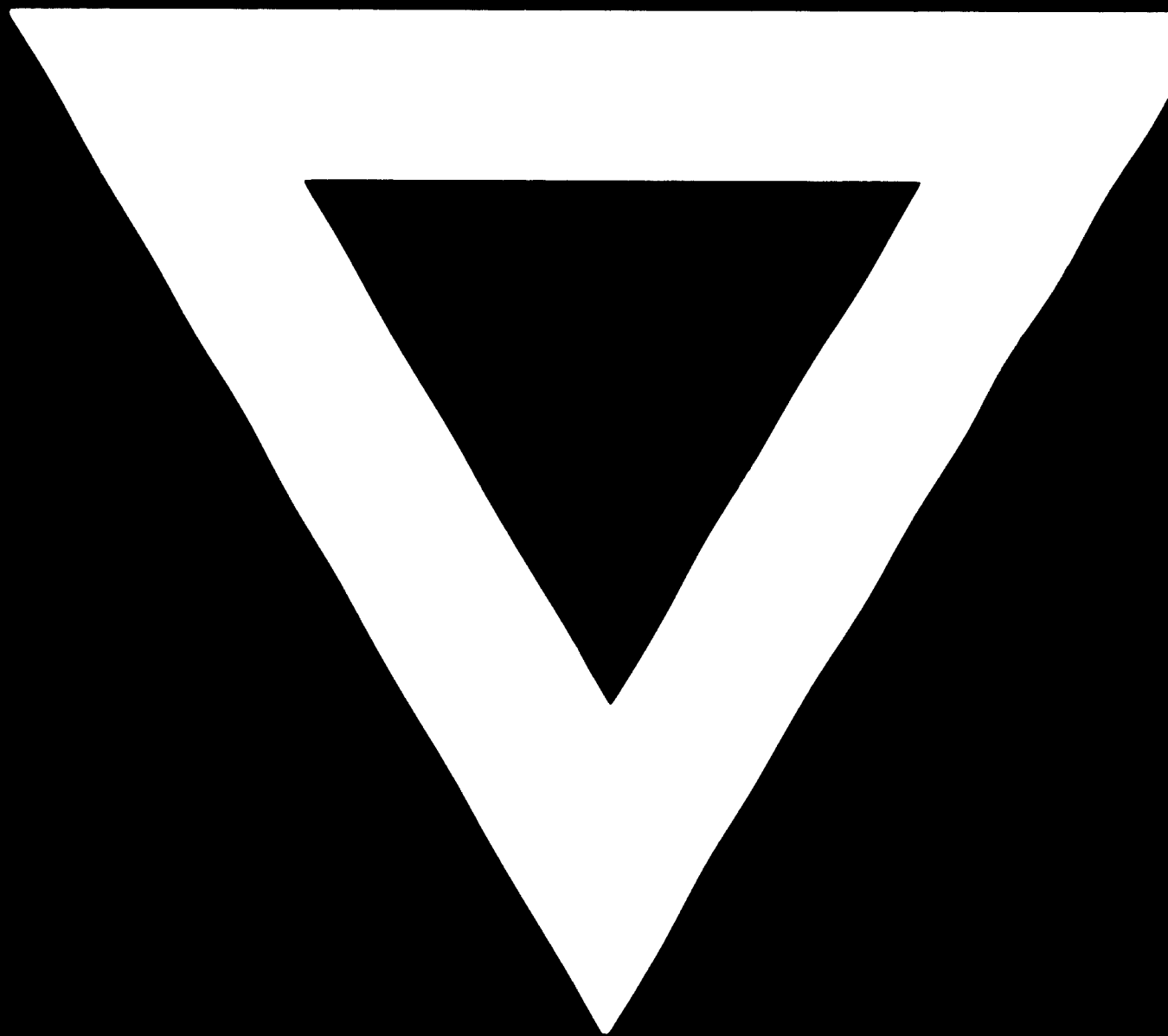
Date ...

NOISE CHART

Intensity factor	Intensity level db	Zones	Dwell time h	Noise source
		deafening		jet aircraft at 25 m riveting hammer molding machine-planer
		THRESHOLD OF PAIN		
		risk		circular saw mechanical workshop rolling mill
		safety		heavy traffic normal conversation quiet conversation music from radio at low volume whispering
		silence		quiet of the country rustling of leaves
		THRESHOLD OF HEARING		



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Technical Course on Criteria for the
Selection of Woodworking Machinery
Milan, Italy, 8 - 19 May 1978

GENERAL CRITERIA FOR THE SELECTION OF MACHINES *

by

J.L. Della Torre**

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- * The views and opinions expressed in this paper are those of the author and do not necessarily reflect the views of the secretariat of UNIDO. This document has been reproduced without formal editing.
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1. Introduction

In all industrial concerns, whatever their size, purchasing of capital goods is becoming increasingly important due to its incidence on turnover, but an extremely delicate task is entrusted to those who have to consider the purchase of machines or systems.

Sophistication of these items has led to increased investment costs and therefore constant efficiency, especially in mass production, as well as the need for the finished product to meet required quality standards, are only some of the main elements determining economic results. Careful choice is therefore of prime importance.

The object of this report is to emphasize, in a general survey, the principles for the choice of machines or systems to be purchased. Specialized principles will appear in later reports on various types of production.

The subjects dealt with are intended to give as much coverage as possible to the processing of logs; above all, notions which can be enlarged upon during the discussion.

Whenever the purchase of a machine is contemplated (machine being intended in its widest sense: machinery, systems, servo-mechanisms, etc.) at least the following questions instinctively arise:

- why purchase
- what to purchase
- when to purchase
- how to purchase

Replies to these questions involves treating them as natural consequences of three fundamental purchasing components:

- a) technical-productive
- b) economic
- c) commercial.

In order to reach these conclusions machinery must be considered in two of its qualifying aspects:

Machinery in the productive context.

(Productive entity - dynamic)

Machinery in its intrinsic make up

(Physical and technical entity - static)

2. The manufacturing Process.

Considering machinery in its productive context signifies examining a large number of strictly interdependent parameters, difficult to classify in order of priority but all of them important for the optimization of a man-machine-ambience system.

Some are referred to below:

The productive process in general

As may be noted on Encl. 2 many wood products may be considered "finished" in those industries making only one product (e.g. plywood) or "semifinished" if they go to make up more complex products (e.g. furniture).

This schematic representation already calls our attention to the considerable variety in production parts which, while often having something in common among their various applications, should be considered from different points of view according to whether they go to make up a product with a manufacturing cycle having few or many operations, and even more if production is an integral cycle (e.g. from log to finished ~~product~~ furniture).

3. The product

ve referred above (A.1) to the production processes required to transform the wood into saleable products. But the product finds a reason for its existence in the need of the **end user**, a need which is stimulated and which stimulates the market in mutual action and feedback with all the relative problems concentrated in marketing.

For consumer products this means the reality of industrial design (a premise to technical drawing) which, in the light of production facilities and object function (value analysis), appears in the various manufacturing phases detailed in "production cycles". These cycles specify methods as well as the machinery required which, among other things, must be consistent with:

- a) the quantity of parts to be made in the unit of time taken as a reference;
- b) assortments of semifinished parts in production simultaneously;
- c) type of supply: for a work order or for stock;
- d) quality level of the product stipulated for its sale.

4. Size and siting of the factory

- 4.1. Economic resources (finance available, turnover, development programme etc.).
- 4.2. Personnel (qualifications, remuneration, cost, availability etc.).
- 4.3. Geo-economic area (climate, availability of mechanical energy, infrastructures, availability of raw and auxiliary materials, state of communications and transport, access to purchasing sources etc.).

4. Organizational structure and its reaction on technical-economic management of resources (production planning, terotechnology etc.).

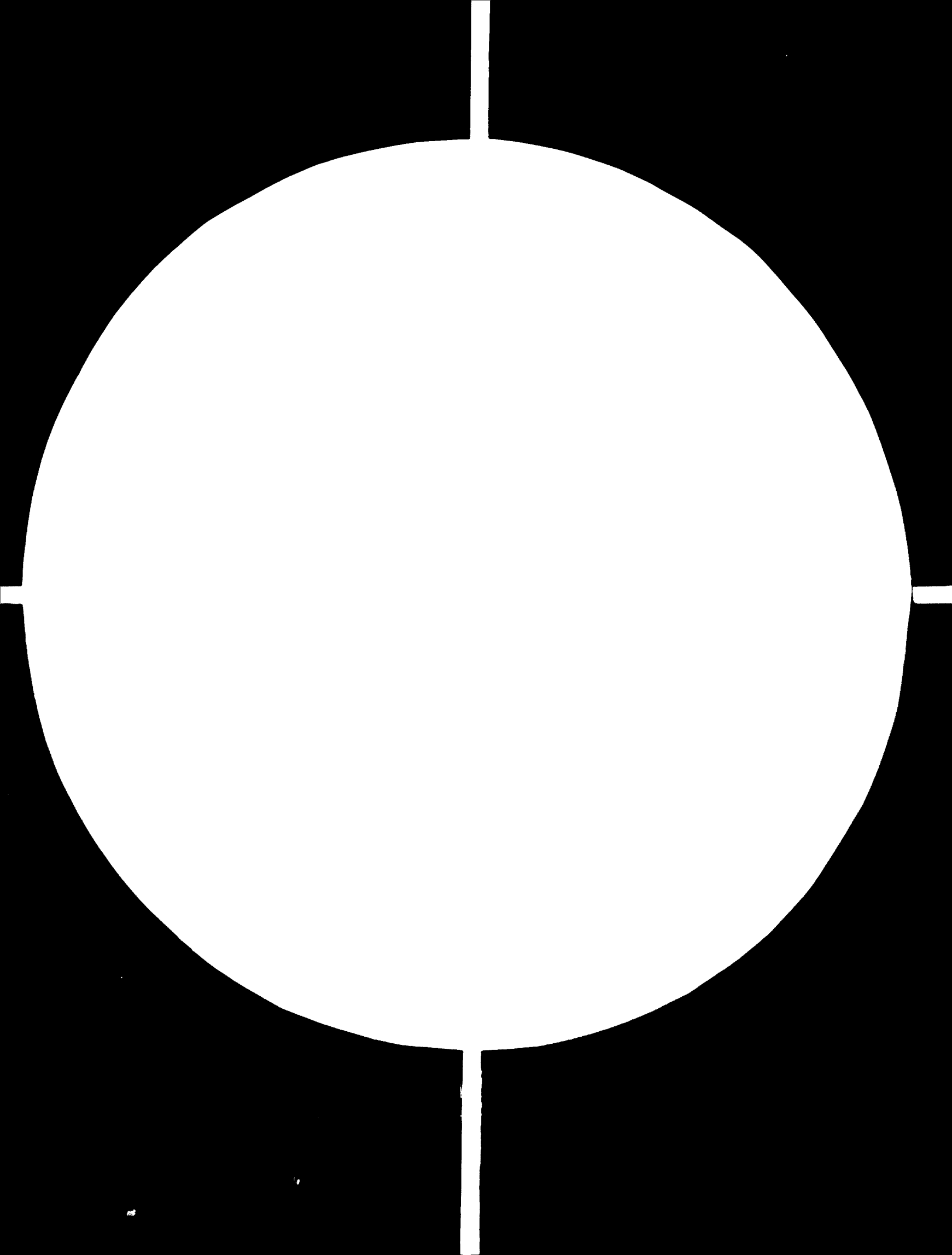
5. production planning

High production costs (direct labour and social charges, material, wear and tear, depreciation etc.) make it necessary to avoid hold ups due to lack of supplies, bottlenecks, accumulation of materials, insufficient equipment etc., which become liabilities due to space wasting, useless handling, material in stock with interest on capital; all to the detriment of productivity and therefore adding to the finished product cost.

It is therefore vital to foresee these inconveniences and carefully plan, as far as humanly possible, to eliminate delays, co-ordinate the various sequences and balance machine utilization to achieve the final objective of optimizing the resources available.

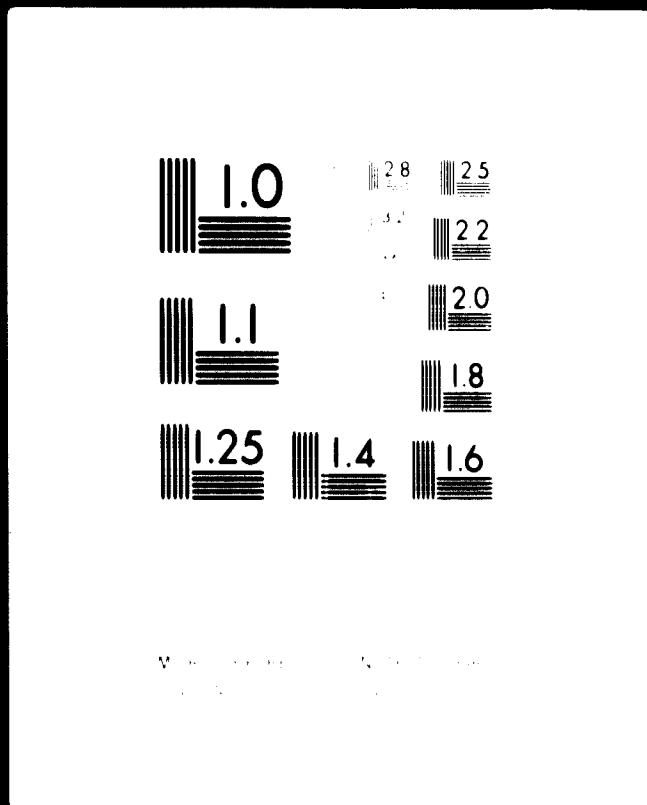
For the more complex cases there are mathematical techniques for Operational Research (linear programming, queuing theory etc.) which, with the aid of a Data Processing Centre, are able to provide backing for these requirements.

In dealing with planning and manufacturing methods, mention must be made of the experiments being carried out which, in overcoming the Taylorian diagrams, with the substitution of elementary operations and monotonous repetition of operations, should increase job enrichment of workers and therefore their major participation and interest. It should also reduce frustration which leads to absenteeism and turnover, factors having a considerable influence on the quality of work and product.



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The desire to acquire machines having these features must not cause the following considerations to be overlooked:

- high investment cost
- possibility of increased utilization
- technical up-dating with reflection of premature obsolescence
- complexity with its influence on maintenance and servicing
- tooling up times
- times, costs and practical possibilities for programme preparation for NC machines
- possibility of obtaining special tools and essential mechanical and electronic spare parts, even after a reasonable lapse of time.

It must be emphasized that the economic values involved make these machines convenient when they are used on a continuous basis (even on three shifts). Therefore, the purchase of a machine which is not fully exploited, or left inactive, is most unwise.

To explain the "fundamental purchasing components" mentioned in the foreword i.e.:

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7.1 Technical-productive component

7.1.1 Hygiene and safety

7.1.2 Accident prevention:

Accident source statistics, while including some collateral causes and incidental factors (2 %), consist almost entirely of two main factors of which the human element is 88 % and technical 10 %.

Without doubt wood working machines may be considered among the most dangerous, for the distracted or unskilled operator, especially if not provided with all the technically feasible safety measures. All machine producing countries have strict and precise safety regulations and machines must be sold in conformity with them.

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Noise assumes an important role in factory life due to its social and economic implications. It is a considerable burden and much is done to reduce it at source (on the machine itself) and to reduce its transmission by insulating the machine and the environment with sound deadening material. Its effect on operators is also limited by means of suitable personal protective measures, with labour turnover etc.

It is, therefore, very important to take this factor into account in the choice of machinery.

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This is dangerous to human beings, makes accurate work difficult to achieve and leads to many failures in machines and environmental structures. Machines must be provided with suitable damping where necessary.

7.1.5 Protection against dust, chips, smoke, vapours, humidity and their automatic extraction. All machines should be provided with a means for connecting up to a general exhaust system.

7.1.6 Viability and illumination of the working zone and practicability.

7.1.7 Machine body designed to eliminate or minimize dangerous projecting parts and sharp edges.

7.1.8 Ergonomics of man-machine combination and physiological and functional chromatism, as regards main colour and that of individual parts, for easy and instinctive access to functions (controls, electrical and hydraulic equipment, working zone etc.).

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7.2.1 Incidence of cost for special tools.

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7.3.1 Maintenance aptitude

Ease of maintenance, such as access to parts liable to failure, and possibility of easy handling of tools for rapid repairs.

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The high cost of machinery does not permit the installation of stand-bys and therefore the above-mentioned coefficient must be kept high:

$$\frac{\text{available hours}}{\text{actual hours}}$$

A failure does not only involve the burden resulting from the repair and/or maintenance operation, but also costs involved in production losses during the failure, of re-starting the machine, and of any defective production before settling down again to normal running. If it is also considered that, in some cases, annual maintenance costs are over 8 per cent of the capital invested, the importance of this parameter can immediately be appreciated.

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The ratio between the average time interval between two breakdowns (T), and T plus the average duration of a breakdown (F), represents efficiency (or Availability) i.e. the percentage of time during which the machine should function without breakdowns ($E = \frac{T}{T + F}$).

Unfortunately these values and the relative technical-commercial guarantees, very important for the evaluation of costly and complex machines, are still difficult to obtain from manufacturers who have only recently commenced collecting the necessary statistical data.

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- Use of reliable automatic devices for loading, clamping
- Application of automatic loading and unloading (robot or transfer)
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- Dimensioning of moving parts or those more subject to stress (shafts, bearings, bushes, gears etc.) and their accurate lubrication and cooling.
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This is specific for the operations involved. It defines operative capability (quantity and quality) of the machine for the material being used, the involvement being: forming (presses), stock removal (sawing machines, planers, etc.), coating (spreaders, automatic roller painters, sprayers etc.) or in other words any modification to the state of the workpiece between input and output.

Among particular characteristics, operational speed and working tolerances should be underlined.

8. Economic component

8.1 Investment

- Machine purchase price plus charges for transport customs, insurance etc.
- Obsolescence prospects (residual value).
- Problems concerning machine base, foundations, environmental conditions, etc.
- Floor space and height.
- Cost of NC unit.
- Optionals.
- Cost of connections and/or alternatives or expansion of infrastructures, such as electric, hydraulic, pneumatic systems, etc.
- Expenses involved in any modification to existing systems and moving of other machines and equipment.
- Testing and commissioning costs.
- Costs for training of personnel.
- Depreciation indexes (real and fiscal).

8.2 Management

- Operational or running costs (direct and indirect labour, breakdown costs etc.).
- Qualifications of personnel and pertinent remuneration.
- Consumption of energy for a given production.
- Facility of loading and unloading workpieces.
- Operational flexibility: max. and min. dimensions of workpiece.
- Reject coefficient.
- Characteristics of waste and losses due to scrap.
- Cost of floor space occupied.

9. Commercial component

Elements for commercial negotiations are fully dealt with in "General Conditions for the Supply and Erection of Plant and Machinery for Import and Export" established by the United Nations Economic Commission for Europe (Appendix I).

The following, however, may be considered as complementary to these conditions:

9.1 Quotation request

It is always advisable to ask for the characteristics of the supply and its price by means of a formal "Quotation request" which, attached to the "Quotation", the "Purchase order", the "Order acknowledgement" and the illustrations (leaflets, drawings, etc.) referred to constitute the technical, economic and legal documentation of the supply. In periods of price increase, like the present, quotations should include validity and indicate formulae for possible price escalation.

9.2 Customs tariff number

9 It is advisable to give a precise description (also for customs purposes) of the machine required. In this regard several countries are working on the standardization of the terminology defining all wood working machines. Standardization work which is already in a fairly advanced state of development is being carried out by EUMCBOIS.

9.3 Specifications

The quotation request should include the technical specifications to which the machines intended to be purchased should conform. These specifications should be drawn up by the purchaser or he should refer to well known specifications (e.g. SCHLESINGER, STANIMUC, NAS for NC machines).

9.4 Documentation

According to the complexity of the supply, adequate documentation should be included in the appropriate language and comprise:

- installation layouts
- wiring diagrams
- operating manuals
- maintenance manuals
- programming manuals for NC
- illustrated list of spare parts
- stock cards

9.5 Delivery scheduling of machinery or equipment

It is essential that careful programming as to delivery of various items of equipment be the subject of advanced programming so that a mistake does not occur whereby an item may arrive on the scene far ahead of one which must first be installed to allow that particular piece to become operative or effective. If such a programme is not properly adhered to it can very well be that certain pieces of equipment or machinery may arrive well in advance of its scheduled time for installation and consequently may be subject to damage due to having to remain in either a crated or uncrated condition for a long period of time unprotected from local weather conditions at the plant site. In such cases damage could result due to rusting, dust particles, or even pilferage.

9.6 General terms of delivery

While it is to be recognized upon examining contents of the document under appendix I that some reference has been made to terms of delivery for equipment it is deemed necessary to also ^{include} a supplementary document (Appendix II) which has particular reference to "General terms of delivery" only. This latter document, as indicated therein, has been drafted with reference to Documents No. 188A and 730, published and recommended by the United Nations Economic Commission for Europe. It is a document which has been amended up to 1 January 1977 and is applicable where contracts are involved with the Association of Machinery and Steel Construction Industries throughout Europe.

While including this document it has been necessary to exclude paragraph 1.3 because it concerns special terms for one country only on erection and assembly work. In the case of Developing Countries it is considered advisable that they pay particular attention to the contents of both Appendices where they become involved in purchasing of machinery or equipment.

ANNEX I

Block diagram illustration of wood processing operations

Operations	Production facilities	Products
Physical-chemical treatment	{ tanks { autoclaves { driers, etc.	{ chemicals { wood pulp, etc.
Mechanical processing	{ slicing machines { peeling machine { saw { planer { moulding machine { boring machine, etc.	{ planks { veneers (sliced) { veneers (peeled) { etc.
Bonding	{ presses (cold/hot) { clamps	{ plywood { particle board { fibreboard
Surface finishing	{ sanding machines { printing machines { automatic roller { painters { engravers { driers, etc.	{ furniture { doors and windows { frames { carpentry, etc.

ANNEX II

Typical progress of wear rate during lifetime of a machine

Number of breakdowns:

Time lost:

1st
period

2nd
period

3rd
period

1st period: referred to as "infant mortality" and is characterized by a fairly high breakdown rate which rapidly decreased (normally manufacturing faults)

2nd period: referred to as the "useful life" and is characterized by a constant breakdown rate. Breakdowns occur casually regardless of the life of the machine

3rd period: usually referred to as the "old age" period and is characterized by an increasing breakdown rate mainly because of its age.

ANNEX III

Relationship chart on showing the importance of location of various departments in a hypothetical medium size plant

Raw material stores	B
General stores	B C
Finished product stores	A B B
Engineering and contracts dep't.	C C C C
Personnel office	C A A A A
Production office	A B A D C A
Mechanical shop	A A B A D A D
Dress shop	A A A B B A A C
Paint shop	D C D A B B A C C
Packing department	A D C D A B B A C C
Dispatch department	C C B A A B B C C C
Tool and maintenance departments	B C B D C B C C C A
Machine maintenance department	B B C B D C B C C C
General maintenance department	B B C B D C B C C C

- Code to, above chart:
- (A) - important
 - (B) - medium importance
 - (C) - indifferent
 - (D) - to be avoided

We regret that some of the pages in the microfiche copy of this report may not be up to the proper legibility standards, even though the best possible copy was used for preparing the master fiche

ANNEX IV

Machine layout and schedule

Description	Services		Location		
			Factory	Floor	Bay
Machine	Main motor				
Make	..... V	..... phase			
Model	..... Hz	... HP			
Catalogue No.	.....RPM				
Capacity	Control gear				
Tool list	..... V	AC - DC			
Inventory No.	intake	Gas			
Drawing No.	water	coolant			
Charges	outlet				
	steam				
Cost.....	Date.....	Condition.....			
		Foundation	Yes	No	
Length....	Width....	Drawing No.	Scale 1:50		
Height....	Weight...	Grouting	Notes.....		
Special features....	anchor bolts				
	Dampers				

Date:.....

GENERAL CONDITIONS FOR THE SUPPLY AND ERECTION
OF PLANT AND MACHINERY FOR IMPORT AND EXPORT

UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE
GENEVA, MARCH 1957

1. PREAMBLE

1. These general conditions shall apply, save as varied by express agreement accepted in writing by both parties.

2. FORMATION OF CONTRACT

- 2.1. The Contract shall be deemed to have been entered into when, upon receipt of an order, the Contractor has sent an acceptance in writing within the time-limit (if any) fixed by the Purchaser.
- 2.2. If the Contractor, in drawing up his tender, has fixed a time-limit for acceptance, the Contract shall be deemed to have been entered into when the Purchaser has sent an acceptance in writing before the expiration of such time-limit, provided that there shall be no binding Contract unless the acceptance reaches the Contractor not later than one week after the expiration of such time-limit.

3. DRAWINGS AND DESCRIPTIVE DOCUMENTS

- 3.1. The weights, dimensions, capacities, prices, performance ratings and other data included in catalogues, prospectuses, circulars, advertisements, illustrated matter and price lists constitute an approximate guide. These data shall not be binding save to the extent that they are by reference expressly included in the Contract.
- 3.2. Any drawings or technical documents intended for use in the construction or erection of the Works⁽¹⁾ or of part thereof and submitted to the Purchaser prior or subsequent to the formation of the Contract remain the exclusive property of the Contractor. They may not, without the Contractor's consent, be utilized by the Purchaser or copied, reproduced, transmitted or communicated to a third party. Provided, however, that the said plans and documents shall be the property of the Purchaser:
- (a) if it is expressly so agreed, or
 - (b) if they are referable to a separate preliminary development contract on which no actual construction was to be performed and in which the property of the Contractor in the said plans and documents was not reserved.
- 3.3. Any drawings or technical documents intended for use in the construction or erection of the Works or of part thereof and submitted to the Contractor by the Purchaser prior or subsequent to the formation of the Contract remain the exclusive property of the Purchaser. They may not, without his consent, be utilized by the Contractor or copied, reproduced, transmitted or communicated to a third party.
- 3.4. The Contractor shall, if required by the Purchaser, furnish free of charge to the Purchaser at the commencement of the Guarantee Period, as defined in Clause 23, information and drawings other than manufacturing drawings of the Works in sufficient detail to enable the Purchaser to carry out the operation and maintenance (including running repairs) of all parts of the Works and (except where under the Contract the Contractor is responsible for commissioning the Works) the commissioning thereof. Such information and drawings shall be the property of the Purchaser and the restrictions on their use set out in paragraph 2 hereof shall not apply thereto. Provided that if the Contractor so stipulates, they shall remain confidential.

4. PACKING

- 4.1. Unless otherwise specified:
- (a) prices shown in price lists and catalogues shall be deemed to apply to unpacked Plant;
 - (b) prices quoted in tenders and in the Contract shall include the cost of packing or protection required under normal transport conditions to prevent damage to or deterioration of the Plant before it reaches its destination as stated in the Contract.

(*) These Conditions may be used, at the option of the parties, as an alternative to the General Conditions for the Supply and Erection of Plant and Machinery for Import and Export prepared at Geneva, in March 1957 (No. 574 A).
The English, French and Russian texts are equally authentic.

The observations of the experts who drew up these General Conditions, together with a description of the procedure followed, are embodied in the "COM-MENTARY ON THE GENERAL CONDITIONS FOR THE SUPPLY OF PLANT AND MACHINERY FOR EXPORT No. 188" (Document E/ECE/169), published by the Economic Commission for Europe. It can be obtained direct from the Sales Section of the European Office of the United Nations, Geneva, Switzerland, or through United Nations Sales Agents.

(1) In these General Conditions "Plant" means all machinery, apparatus, materials and articles to be supplied by the Contractor under the Contract and "the Works" means all Plant to be supplied and work to be done by the Contractor under the Contract.

5. LOCAL LAWS AND REGULATIONS

- 5.1. The Purchaser shall, at the request of the Contractor and to the best of his ability, assist the Contractor to obtain the necessary information concerning the local laws and regulations applicable to the Works and to taxes and dues connected therewith.
- 5.2. If, by reason of any change in such laws and regulations occurring after the date of the tender, the cost of erection is increased or reduced, the amount of such increase or reduction shall be added to or deducted from the price, as the case may be.

6. WORKING CONDITIONS

- 6.1. The price shall be on the understanding that the following conditions are fulfilled, except so far as the Purchaser has informed the Contractor to the contrary:
- (a) the Works shall not be carried out in unhealthy or dangerous surroundings;
 - (b) the Contractor's employees shall be able to obtain suitable and convenient board and lodging in the neighbourhood of the site and shall have access to adequate medical services;
 - (c) such equipment, consumable stores, water and power as are specified in the Contract shall be available to the Contractor on the site in good time, and, unless otherwise agreed, free of charge to the Contractor;
 - (d) the Purchaser shall provide the Contractor (free of charge, unless otherwise agreed) with closed or guarded premises on or near the site as a protection against theft and deterioration of the Plant to be erected, of the tools and equipment required therefor, and of the clothing of the Contractor's employees;
 - (e) the Contractor shall not be required to undertake any works of construction or demolition or to take any other unusual measures to enable the Plant to be brought from the point where it has been unloaded to the point on the site where it is to be erected, unless the Contractor has agreed to deliver the Plant to the last mentioned point.
- Any departure from the conditions mentioned in this paragraph shall attract an extra charge.
- 6.2. If the circumstances resulting from such departure are such that it would be unreasonable to require the Contractor to proceed with the Works, the Contractor may, without prejudice to his rights under the Contract, refuse to do so.

7. ERECTION ON A TIME BASIS AND LUMP SUM ERECTION

- 7.1. When erection is carried out on a time basis the following items shall be separately charged:
- (a) all travelling expenses incurred by the Contractor in respect of his employees and the transport of their equipment and personal effects (within reasonable limits) in accordance with the specified method and class of travel where these are specified in the Contract;
 - (b) the living expenses, including any appropriate allowances, of the Contractor's employees for each day's absence from their homes, including non-working days and holidays;
 - (c) the time worked, which shall be calculated by reference to the number of hours certified as worked in the time-sheets signed by the Purchaser. Overtime and work on Sundays, holidays and at night will be charged at the special rates mentioned in the Contract. Save as otherwise provided, the hourly rates cover the wear and tear and depreciation of the Contractor's tools and light equipment;
 - (d) time necessarily spent on:
 - (i) preparation and formalities incidental to the outward and homeward journeys;
 - (ii) the outward and homeward journeys;
 - (iii) daily travel morning and evening between lodgings and the site if it exceeds half an hour and there are no suitable lodgings closer to the site;
 - (iv) waiting when work is prevented by circumstances for which the Contractor is not responsible under the Contract;
 - (e) any expenses incurred by the Contractor in accordance with the Contract, in connexion with the provision of equipment by him, including where appropriate a charge for the use of the Contractor's own heavy equipment;
 - (f) any taxes or dues levied on the invoice and paid by the Contractor in the country where erection takes place.
- 7.2. When erection is carried out for a lump sum, the quoted price includes all the items above mentioned. Provided that if the erection is prolonged for any cause for which the Purchaser or any of his contractors other than the Contractor is responsible and if as a result the work of the Contractor's employees is suspended or added to, a charge will be made for any idle time, any extra work, any extra living expenses of the Contractor's employees and the cost of any extra journey.

8. INSPECTION AND TESTS OF THE PLANT

Inspection

- 8.1. If expressly agreed in the Contract, the Purchaser shall be entitled to have the quality of the materials used and the parts of the Plant, both during manufacture and when completed, inspected and checked by his authorized representatives. Such inspection and checking shall be carried out at the place of manufacture during normal working hours after agreement with the Contractor as to date and time.
- 8.2. If as a result of such inspection and checking the Purchaser shall be of the opinion that any materials or parts are defective or not in accordance with the Contract, he shall state in writing his objections and the reason therefor.

Tests

- 8.3. Tests provided for in the Contract other than taking over tests will be carried out, unless otherwise agreed, at the Contractor's works and during normal working hours. If the technical requirements of the tests are not specified in the Contract, the tests will be carried out in accordance with the general practice obtaining in the appropriate branch of the industry in the country where the Plant is manufactured.
- 8.4. The Contractor shall give to the Purchaser sufficient notice of the tests to permit the Purchaser's representatives to attend. If the Purchaser is not represented at the tests, the test report shall be communicated by the Contractor to the Purchaser and shall be accepted as accurate by the Purchaser.
- 8.5. If on any test (other than a taking-over test as provided for in Clause 21) the Plant shall be found to be defective or not in accordance with the Contract, the Contractor shall with all speed make good the defect or ensure that the Plant complies with the Contract. Thereafter, if the Purchaser so requires, the test shall be repeated.
- 8.6. Unless otherwise agreed, the Contractor shall bear all the expenses of tests carried out in his works, except the personal expenses of the Purchaser's representatives.

9. PASSING OF RISK

- 9.1. Save as provided in paragraph 10.1, the time at which the risk shall pass shall be fixed in accordance with the International Rules for the Interpretation of Trade Terms (Incoterms) of the International Chamber of Commerce in force at the date of the formation of the Contract.

Where no indication is given in the Contract of the form of sale the Plant shall be deemed to be sold "ex works."

- 9.2. In the case of a sale "ex works", the Contractor must give notice in writing to the Purchaser of the date on which the Purchaser must take delivery of the Plant. The notice of the Contractor must be given in sufficient time to allow the Purchaser to take such measures as are normally necessary for the purpose of taking delivery.

10. DELAYED ACCEPTANCE OF DELIVERY

- 10.1. If the Purchaser fails to accept delivery of the Plant on due date, he shall nevertheless make any payment conditional on delivery as if the Plant had been delivered. The Contractor shall arrange for the storage of the Plant at the risk and cost of the Purchaser. If required by the Purchaser, the Contractor shall insure the Plant at the cost of the Purchaser. Provided that if the delay in accepting delivery is due to one of the circumstances mentioned in Clause 25 and the Contractor is in a position to store it in his premises without prejudice to his business, the cost of storing the Plant shall not be borne by the Purchaser.

- 10.2. Unless the failure of the Purchaser is due to any of the circumstances mentioned in Clause 25, the Contractor may require the Purchaser by notice in writing to accept delivery within a reasonable time.

If the Purchaser fails for any reason whatever to do so within such time, the Contractor shall be entitled by notice in writing to the Purchaser, and without requiring the consent of any Court, to terminate the Contract in respect of such portion of the Plant as is by reason of the failure of the Purchaser aforesaid not delivered and thereupon to recover from the purchaser any loss suffered by reason of such failure up to an amount not exceeding the sum named in paragraph A of the Appendix or, if no sum be named, that part of the price payable under the Contract which is properly attributable to such portion of the Plant.

11. PAYMENT

- 11.1. Payment shall be made in the manner and at the time or times agreed by the parties.
- 11.2. Any advance payments made by the Purchaser are payments on account and do not constitute a deposit, the abandonment of which would entitle either party to terminate the Contract.
- 11.3. If delivery has been made before payment of the whole sum payable under Contract, Plant delivered shall, to the extent permitted by the law of the country where the Plant is situated after delivery, remain the property of the Contractor until such payment has been effected. If such law does not permit the Contractor to retain the property in the Plant, the Contractor shall be entitled to the benefit of such other rights in respect thereof as such law permits him to retain. The Purchaser shall give the Contractor every assistance in taking any measures required to protect the Contractor's right of property or such other rights as aforesaid.
- 11.4. A payment conditional on the fulfilment of an obligation by the Contractor shall not be due until such obligation has been fulfilled, unless the failure of the Contractor is due to an act or omission of the Purchaser.
- 11.5. If the Purchaser delays in making any payment, the Contractor may postpone the fulfilment of his own obligations until such payment is made, unless the failure of the Purchaser is due to an act or omission of the Contractor.
- 11.6. If delay by the Purchaser in making any payment is due to one of the circumstances mentioned in Clause 25, the Contractor shall not be entitled to any interest on the sum due.
- 11.7. Save as aforesaid, if the Purchaser delays in making any payment, the Contractor shall on giving to the Purchaser within a reasonable time notice in writing be entitled to the payment of interest on the sum due at the rate fixed in paragraph B of the Appendix from the date on which such sum became due. If at the end of the period fixed in paragraph C of the Appendix, the Purchaser shall still have failed to pay the sum due, the Contractor shall be entitled by notice in writing to the Purchaser, and without requiring the consent of any Court, to terminate the Contract and thereupon to recover from the Purchaser the amount of his loss up to the sum mentioned in paragraph A of the Appendix.

12. PREPARATORY WORK

- 12.1. The Contractor shall in good time provide drawings showing the manner in which the Plant is to be affixed together with all information relating, unless otherwise agreed, only to the Works, required for preparing suitable foundations, for providing suitable access for the Plant and any necessary equipment to the point on the site where the Plant is to be erected and for making all necessary connexions to the Plant (whether such connexions are to be made by the Contractor under the Contract or not).
- 12.2. The preparatory work shall be executed by the Purchaser in accordance with the drawings and information provided by the Contractor and mentioned in paragraph 1 hereof. It shall be completed in good time and the foundations shall be capable of taking the Plant at the proper time. Where the Purchaser is responsible for transporting the Plant, it shall be on the site in good time.
- 12.3. Any expenses resulting from an error or omission in the drawings or information mentioned in paragraph 1 hereof which appears before taking over shall be borne by the Contractor. Any such error or omission which appears after taking over shall be deemed faulty design for purposes of Clause 23.

13. LIAISON AGENTS

- 13.1. The Contractor and Purchaser shall each designate in writing a competent representative to be his channel of communication with the other party on the day-to-day execution of the Works on the site.
- 13.2. Each such representative shall be present on or near the site during working hours.

14. ADDITIONAL LABOUR

- 14.1. If the Contractor so requires in good time the Purchaser shall make available to the Contractor free of charge such skilled and unskilled labour as is provided for in the Contract and such further reasonable amount of unskilled labour as may be found to be necessary even if not provided for in the Contract.

15. SAFETY REGULATIONS

- 15.1. The Purchaser shall notify the Contractor in full of the safety regulations which the Purchaser imposes on his own employees and the Contractor shall secure the observance by his employees of such safety regulations.
- 15.2. If breaches of these regulations come to the notice of the Purchaser, he must inform the Contractor in writing forthwith, and may forbid persons guilty of such breaches entry to the site.
- 15.3. The Contractor shall inform the Purchaser in full of any special dangers which the execution of the Works may entail.

16. OVERTIME

- 16.1. Any overtime and the conditions thereof shall, within the limits of the laws and regulations of the Contractor's country and of the country where erection is carried out, be as agreed between the parties.

17. WORK OUTSIDE THE CONTRACT

- 17.1. The Purchaser shall not be entitled to use the Contractor's employees on any work unconnected with the subject-matter of the Contract without the previous consent of the Contractor. Where the Contractor so consents, he shall not be under any liability in respect of such work, and the Purchaser shall be responsible for the safety of the Contractor's employees while employed on such work.

18. CONTRACTOR'S RIGHT OF INSPECTION

- 18.1. Until the Works are taken over and during any work resulting from the operation of the guarantee the Contractor shall have the right at any time during the hours of work on the site to inspect the Works at his own expense. In proceeding to the site, the inspectors shall observe the regulations as to movement in force at the Purchaser's premises.

19. INSTRUCTION OF THE PURCHASER'S EMPLOYEES

- 19.1. In appropriate cases the Contract may provide on the terms and conditions therein set out for instruction to be given by the Contractor to the Purchaser's employees who will run the Plant.

20. TIME FOR COMPLETION

- 20.1. Unless otherwise agreed the completion period shall run from the latest of the following dates:
 - (a) the date of the formation of the Contract as defined in Clause 2;
 - (b) the date on which the Contractor receives notice of the issue of a valid import licence where such is necessary for the execution of the Contract;
 - (c) the date of the receipt by the Contractor of such payment in advance of manufacture as is stipulated in the Contract.

- 20.2 Should delay in completion be caused by any of the circumstances mentioned in Clause 25 or by an act or omission of the Purchaser and whether such cause occur before or after the time or extended time for completion, there shall be granted subject to the provisions of paragraph 5 hereof such extension of the completion period as is reasonable having regard to all the circumstances of the case.
- 20.3 If a fixed time for completion is provided for in the Contract, and the Contractor fails to complete the Works within such time or any extension thereof granted under paragraph 2 hereof, the Purchaser shall be entitled, on giving to the Contractor within a reasonable time notice in writing, to claim a reduction of the price payable under the Contract, unless it can be reasonably concluded from the circumstances of the particular case that the Purchaser has suffered no loss. Such reduction shall equal the percentage named in paragraph D of the Appendix of that part of the price payable under the Contract which is properly attributable to such portion of the Works as cannot in consequence of the said failure be put to the use intended for each complete week of delay commencing on the due date of completion but shall not exceed the maximum percentage named in paragraph E of the Appendix. Such reduction shall be allowed when a payment becomes due on or after completion. Save as provided in paragraph 5 hereof, such reduction of price shall be to the exclusion of any other remedy of the Purchaser in respect of the Contractor's failure to complete as aforesaid.
- 20.4 If the time for completion mentioned in the Contract is an estimate only, either party may after the expiration of two thirds of such estimated time require the other party in writing to agree a fixed time.
- Where no time for completion is mentioned in the Contract, this course shall be open to either party after the expiration of nine months from the formation of the Contract.
- If in either case the parties fail to agree, either party may have recourse to arbitration, in accordance with the provisions of Clause 28, to determine a reasonable time for completion and the time so determined shall be deemed to be the fixed time for completion provided for in the Contract and paragraph 5 hereof shall apply accordingly.
- 20.5 If any portion of the Works in respect of which the Purchaser has become entitled to the maximum reduction provided for by paragraph 5 hereof, or in respect of which he would have been so entitled had he given the notice referred to therein, remains uncompleted, the Purchaser may by notice in writing to the Contractor require him to complete and by such last mentioned notice fix a final time for completion which shall be reasonable taking into account such delay as has already occurred. If for any cause other than one for which the Purchaser or some other Contractor employed by him is responsible, the Contractor fails to complete within such time, the Purchaser shall be entitled by notice in writing to the Contractor, and without requiring the consent of any Court, to terminate the Contract in respect of such portion of the Works and thereupon to recover from the Contractor any loss suffered by the Purchaser by reason of the failure of the Contractor as aforesaid up to an amount not exceeding the sum named in paragraph F of the Appendix, or, if no sum be named, that part of the price payable under the Contract which is properly attributable to such portion of the Works as could not in consequence of the Contractor's failure be put to the use intended.

21. TAKING-OVER TESTS

- 21.1 Unless otherwise agreed, taking-over tests shall be carried out. If such tests are to be carried out, the Contractor shall notify the Purchaser in writing when the Works will be ready, and such notification shall be in sufficient time to enable the Purchaser to make any necessary arrangements. The tests shall take place in the presence of both parties. The technical requirements shall be as specified in the Contract or, if not so specified, in accordance with the general practice existing in the appropriate branch of the industry in the country where the Plant is manufactured.
- 21.2 If as a result of such tests the Works are found to be defective or not in accordance with the Contract, the Contractor shall with all speed and at his own expense make good the defect or ensure that the Works comply with the contract, and thereafter, if the Purchaser so requires, the test shall be repeated at the expense of the Contractor.
- 21.3 Subject to the provisions of paragraph 2 hereof the Purchaser shall free of charge provide any power, lubricants, water, fuel and materials of all kinds reasonably required for final adjustments and for taking-over tests. He shall also install free of charge any apparatus necessary for the above mentioned operations.

22. TAKING OVER

- 22.1 As soon as the Works have been completed in accordance with the Contract and have passed all the taking-over tests to be made on completion of erection, the Purchaser shall be deemed to have taken over the Works and the Guarantee Period shall start to run. The Purchaser shall thereupon issue to the Contractor a certificate, called a "Taking-over Certificate", in which he shall certify the date on which the Works have been completed and have passed the tests.
- 22.2 If the Purchaser is unwilling to have the taking-over tests carried out, the Works shall be deemed to have been taken over and the Guarantee Period shall start to run on a written notice to that effect being given by the Contractor.
- 22.3 If by reason of difficulties encountered by the Purchaser (whether or not covered by Clause 25) it becomes impossible to proceed to the taking-over tests, these shall be postponed for a period not exceeding six months, or such other period as the parties agree, and the following provisions shall apply:
- The Purchaser shall make payments as if the taking over had taken place, provided that, in the case of a difficulty due to any of the circumstances falling within paragraph 25.1, the Purchaser shall not unless otherwise agreed, be required to pay at the due time of taking over the cost of uncompleted work or, before the expiration of the Guarantee Period fixed in accordance with sub-paragraph (d) hereof, any sum retained by way of guarantee.
 - At the appropriate time, the Purchaser shall give notice in writing to the Contractor stating the earliest date on which the tests can be carried out and requesting him to fix a new date for the tests. Such new date shall be within the period stated in paragraph G of the Appendix after the date mentioned in such notice.
 - The Contractor may, at the cost of the Purchaser, examine the Works before making the tests and make good any defect or deterioration therein that may have developed, or loss thereof that may have occurred, after the date when the Works were first ready for testing in accordance with the Contract.
 - The Guarantee Period shall run from the date when the postponed tests have been successfully carried out.

- (e) If the Purchaser so requires, the Contractor shall, subject to the provisions of the Contract in respect of the passing of risk, protect and preserve the Works until the tests are carried out or for one month from the time when the Works were first ready for testing in accordance with the Contract, whichever is the shorter period. The Contractor shall be entitled to recover from the Purchaser the costs of any measures actually taken by the Contractor to protect and preserve the Works. Unless otherwise agreed, the liability of the Contractor for protecting and preserving the Works shall cease on the expiry of such month. If by reason of other commitments the Contractor is unable to leave his employees on the site, he shall give the Purchaser any directions required to enable the Purchaser to make satisfactory arrangements for protecting and preserving the Works.
- (f) If at the end of six months or such other period as the parties may have agreed the tests have not taken place the provisions of paragraph 22.2 shall apply unless the provisions of Clause 25 are applicable.

23. GUARANTEE

- 23.1. Subject as herein after set out, the Contractor undertakes to remedy any defect resulting from faulty design, materials or workmanship.
- 23.2. This liability is limited to defects which appear during the period (called "the Guarantee Period") specified in paragraph H of the Appendix and commencing on taking over.
- 23.3. In respect of such parts (whether of the Contractor's own manufacture or not) of the Works as are expressly mentioned in the Contract, the Guarantee Period shall be such other period (if any) as is specified in respect of each of such parts.
- 23.4. The daily use of the works and the amount by which the Guarantee Period shall be reduced if the Works are used more intensively are stated in paragraph J of the Appendix.
- 23.5. A fresh Guarantee Period equal to that stated in paragraph H of the Appendix shall apply, under the same terms and conditions as those applicable to the original Works, to parts supplied in replacement of the defective parts or to parts renewed in pursuance of this Clause. This provision shall not apply to the remaining parts of the Works, the Guarantee Period of which shall be extended only by a period equal to the period during which the Works are out of action as a result of a defect covered by this Clause.
- 23.6. In order to be able to avail himself of his rights under this Clause the Purchaser shall notify the Contractor in writing, without delay of any defects that have appeared and shall give him every opportunity of inspecting and remedying them.
- 23.7. On receipt of such notification the Contractor shall remedy the defect forthwith and, save as mentioned in paragraph 8 hereof, at his own expense. Save where the nature of the defect is such that it is appropriate to effect repairs on site, the Purchaser shall return to the Contractor any part in which a defect covered by this clause has appeared, for repair or replacement by the Contractor, and in such case the delivery to the Purchaser of such part properly repaired or a part in replacement thereof shall be deemed to be a fulfilment by the Contractor of his obligations under this paragraph in respect of such defective part.
- 23.8. Unless otherwise agreed, the Purchaser shall bear the cost and risk of transport of defective parts and of repaired parts or parts supplied in replacement of such defective parts between the place where the Works are situated and one of the following points:
 - (i) the Contractor's works if the Contract is "ex works" or F. O. R.;
 - (ii) the port from which the Contractor dispatched the Plant if the Contract is F. O. B., F. A. S., C. I. F., or C. & F.;
 - (iii) in all other cases the frontier of the country from which the Contractor dispatched the Plant.
- 23.9. Where, in pursuance of paragraph 7 hereof, repairs are required to be effected on site, the incidence of any travelling or living expenses of the Contractor's employees and the costs and risks of transporting any necessary material or equipment shall be settled, in default of agreement between the parties, in such manner as the arbitrator shall determine to be fair and reasonable.
- 23.10. Defective parts replaced in accordance with this Clause shall be placed at the disposal of the Contractor.
- 23.11. If the Contractor refuses to fulfil his obligations under this Clause or fails to proceed with due diligence after being required so to do, the Purchaser may proceed to do the necessary work at the Contractor's risk and expense, provided that he does so in a reasonable manner.
- 23.12. The Contractor's liability does not apply to defects arising out of materials provided, or out of a design stipulated, by the Purchaser.
- 23.13. The Contractor's liability shall apply only to defects that appear under the conditions of operation provided for by the Contract and under proper use. It does not cover defects due to causes arising after taking over. In particular it does not cover defects arising from the Purchaser's faulty maintenance or from alterations carried out without the Contractor's consent in writing, or from repairs carried out improperly by the Purchaser, nor does it cover normal deterioration.
- 23.14. After taking over and save as in this Clause expressed, the Contractor shall be under no liability even in respect of defects due to causes existing before taking over. It is expressly agreed that the Purchaser shall have no claim in respect of personal injury or of damage to property not the subject matter of the Contract arising after taking over nor for loss of profit unless it is shown from the circumstances of the case that the Contractor has been guilty of gross misconduct.
- 23.15. "Gross misconduct" does not comprise any and every lack of proper care or skill, but means an act or omission on the part of the Contractor implying either a failure to pay due regard to serious consequences which a conscientious Contractor would normally foresee as likely to ensue, or a deliberate disregard of any consequences of such act or omission.

24. LIABILITY FOR PERSONAL INJURY AND DAMAGE TO PROPERTY

- 24.1. In the event of personal injury or damage to property occurring before all the Works have been taken over, the liabilities shall be apportioned as follows:
 - (a) (i) The Contractor shall at his own expense make good any loss or damage to the Plant or Works occurring before the risk therein has passed and arising from any cause whatsoever other than an act or omission of the Purchaser;
 - (ii) the Contractor shall at his own expense make good any loss or damage to the Plant or Works occurring after the risk therein has passed, if such loss or damage is caused by an act or omission of the Contractor;

- (iii) if any portion of the Plant or Works is lost or damaged from a cause for which the Contractor is not responsible by virtue of sub-paragraphs (a) (i) or (a) (ii) hereof, the loss or damage shall, if required by the Purchaser, be made good by the Contractor at the expense of the Purchaser.
 - (b) In respect of damage to the Purchaser's property other than the Works, the Contractor shall indemnify the Purchaser to the extent that such damage was caused by the Contractor, or by the failure of equipment or tools provided by the Contractor for the purpose of the erection, if the circumstances show that the Contractor failed to use proper skill and care.
 - (c) (i) In respect of personal injury, the respective liabilities of the Purchaser and of the Contractor towards the injured person shall be governed by the law of the country where the injury occurred;
 - (ii) if the injured person brings a claim against the Purchaser, the Contractor shall indemnify the Purchaser against such claim to the extent that the injury was due to any of the causes mentioned in sub-paragraph (b) hereof;
 - (iii) if the injured person brings a claim against the Contractor, the Purchaser shall, to the extent permitted by the law of the country where the injury occurred, indemnify the Contractor against such claim save to the extent that, by the operation of sub-paragraph (c) (ii) hereof, the Contractor would have been liable to indemnify the Purchaser had the claim been brought against the Purchaser.
 - (d) In respect of damage to property of third parties, the provisions of sub-paragraph (c) hereof shall apply mutatis mutandis.
 - (e) The provisions of this paragraph shall apply to the acts or omissions of the respective servants of the parties as they apply to the acts or omissions of the parties themselves. Provided always that as respects acts or omissions of the additional labour provided by the Purchaser in accordance with paragraph 14. 1. the Contractor shall be liable for the consequences of such orders and instructions as have been incorrectly given, inadequately expressed or given to a person not purporting to possess the necessary qualifications.
- 24.2. In order to avail himself of his rights under sub-paragraphs (c) and (d) of paragraph 24. 1 the party against whom a claim is made must notify the other of such claim and must permit the other, if the other so wishes, to conduct all negotiations for the settlement of such claim and to act in his stead or, to the extent permitted by the law of the country where the action is brought, to join in such litigation.
- 24.5. Any limitation of the indemnities payable by either party by virtue of this clause shall be as stated in paragraph I of the Appendix.
- 24.4. The provisions of this Clause shall apply equally while the Contractor is on the site in fulfilment of an obligation under Clause 23.

25. RELIEFS

- 25.1. The following shall be considered as cases of relief if they intervene after the formation of the Contract and impede its performance: industrial disputes and any other circumstances (e.g. fire, mobilization, requisition, embargo, currency restrictions, insurrection, shortage of transport, general shortage of materials and restrictions in the use of power) when such other circumstances are beyond the control of the parties.
- 25.2. The party wishing to claim relief by reason of any of the said circumstances shall notify the other party in writing without delay on the intervention and on the cessation thereof.
- 25.3. The effects of the said circumstances, so far as they affect the timely performance of their obligations by the parties, are defined in Clauses 10, 11, 20 and 22. Save as provided in paragraphs 10. 2, 11. 7 and 20. 5, if, by reason of any of the said circumstances, the performance of the Contract within a reasonable time becomes impossible, either party shall be entitled to terminate the Contract by notice in writing to the other party without requiring the consent of any Court.
- 25.4. If the Contract is terminated in accordance with paragraph 5 hereof, the division of the expenses incurred in respect of the Contract shall be determined by agreement between the parties.
- 25.5. In default of agreement it shall be determined by the arbitrator which party has been prevented from performing his obligations and that party shall refund to the other the amount of the said expenses incurred by the other less any amount to be credited in accordance with paragraph 7 hereof, or, where the amount to be so credited exceeds the amount of such expenses, shall be entitled to recover the excess.
- If the arbitrator determines that both parties have been prevented from performing their obligations, he shall apportion the said expenses between the parties in such manner as to him seems fair and reasonable, having regard to all the circumstances of the case.
- 25.6. For the purposes of this Clause "expenses" means actual out-of-pocket expenses reasonably incurred after both parties shall have mitigated their losses as far as possible. Provided that as respects Plant delivered to the Purchaser the Contractor's expenses shall be deemed to be that part of the price payable under the Contract which is properly attributable thereto, due account being taken of any work done in the erection of such Plant.
- 25.7. There shall be credited to the Purchaser against the Contractor's expenses all sums paid or payable under the Contract by the Purchaser to the Contractor.
- There shall be credited to the Contractor against the Purchaser's expenses that part of the price payable under the Contract which is properly attributable to Plant delivered to the Purchaser or, in the case of an incomplete unit, the value of such Plant having regard to its incomplete state. In either case due account shall be taken of any work done in the erection of such Plant.

26. LIMITATION OF DAMAGES

- 26.1. Where either party is liable in damages to the other, these shall not exceed the damage which the party in default could reasonably have foreseen at the time of the formation of the Contract.
- 26.2. The party who sets up a breach of Contract shall be under a duty to take all necessary measures to mitigate the loss which has occurred provided that he can do so without unreasonable inconvenience or cost. Should he fail to do so, the party guilty of the breach may claim a reduction in the damages.

27. RIGHTS AT TERMINATION

27.1. Termination of the Contract, from whatever cause arising, shall be without prejudice to the rights of the parties accrued under the Contract up to the time of termination.

23. ARBITRATION AND LAW APPLICABLE

23.1. Any dispute arising out of the Contract shall be finally settled, in accordance with the Rules of Conciliation and Arbitration of the International Chamber of Commerce, by one or more arbitrators designated in conformity with those Rules.

23.2. Unless otherwise agreed, the Contract shall, so far as is permissible under the law of the country where the Works are carried out, be governed by the law of the Contractor's country.

23.5. If the parties expressly so agree, but not otherwise, the arbitrators shall, in giving their ruling, act as amisables compositeurs.



APPENDIX

(To be completed by parties to the Contract)

	Clause	
A. Maximum amount recoverable on termination by Contractor for failure to take delivery or make payment	10. 2. & 11. 7.	_____ (in the agreed currency)
B. Rate of interest on overdue payments	11. 7.	_____ per cent per annum
C. Period of delay in payment authorizing termination by Contractor	11. 7.	_____ months
D. Percentage to be deducted for each week's delay	20. 5.	_____ %
E. Maximum percentage which the deductions above may not exceed	20. 5.	_____ %
F. Maximum amount recoverable for non-completion	20. 5.	_____ (in the agreed currency)
G. Maximum postponement of taking-over tests by Contractor	22. 5.	_____ weeks
H. Guarantee Period for original Works and parts replaced or renewed	23. 2. & 23. 5.	_____ months
I. Maximum indemnities for personal injury or damage	24. 3.	_____ (in the agreed currency)
J. (1) Daily use of Plant	23. 4.	_____ hours / day
(2) Reduction of Guarantee Period for more intensive use	23. 4.	

SUPPLEMENTARY CLAUSE PRICE REVISION

Should any change occur in the cost of the relevant materials and/or wages during the period of execution of the contract, the agreed prices shall be subject to revision on the basis of the following formula:

$$P_1 = \frac{P_0}{100} (a + b \frac{M_1}{M_0} + c \frac{S_1}{S_0})$$

where:

P_1 = final price for invoicing

P_0 = initial price of goods, as stipulated in the contract and as prevailing at the date of _____ (1)

M_1 = mean (2) of the prices (or price indices) for (type of materials concerned) _____
over the period _____ (5)

M_0 = price (or price indices) for the same materials at the date stipulated above for P_0 .

S_1 = mean (2) of the wages (including social charges) or relevant indices (4) in respect of _____
(specify categories of labour and social charges) over the period _____ (5)

S_0 = wages (including social charges) or relevant indices (4) in respect of the same categories at the date stipulated above for P_0 .

a, b, c, represent the contractually agreed percentage of the individual elements of the initial price, which add up to 100.

$$(a + b + c = 100)$$

a = fixed proportion = _____

b = percentage proportion of materials = _____

c = percentage proportion of wages (including social charges) = _____

Where necessary, b (and if need be, c) can be broken down into as many partial percentages (b_1, b_2, b_3, \dots) as there are variables taken into account ($b_1 + b_2 + b_3 + \dots + b_n = b$).

DOCUMENTATION For the purpose of determining the values of materials and wages, the parties agree to use the following documents as sources of reference:

1. Materials: prices (or price indices) _____ (type of materials)
published by _____ under the headings _____

2. Wages: wages (including related social charges) (or relevant indices)
published by _____ under the headings _____ (5)

Rules for applying the Clause. In the case of partial deliveries which are invoiced separately, the final price shall be calculated separately for each such delivery.

Period of application of the Clause. The revision clause shall cover the delivery period fixed in the contract, together with any extension thereof granted under Clause 20. 2, but shall in no case apply after the date on which the work is completed.

Tolerance. Prices shall not be revised unless the application of the formula produces a plus or minus variation of _____ (6)

Saving Clause. If the parties wish the revision formula to be adjusted or replaced by a more accurate method of calculation when the plus or minus variation exceeds a certain percentage, they shall expressly so agree.

- (1) It is recommended that the parties should, as far as possible, adopt as the initial price the price prevailing at the date of the contract and not at an earlier date. This is normally the contract price less cost of packing, transport and insurance.
- (2) Arithmetic or weighted.
- (3) Specify the datum period, which may be defined as part or the whole of the delivery period.
- (4) If legal social charges are covered by the index, they need not be taken into account again.
- (5) Indices relating specifically to the engineering and electrical industries should be used as far as possible.
- (6) State the percentage plus or minus variation which must be exceeded before the formula is applied.

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Technical Course on Criteria for the
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GENERAL CRITERIA FOR THE SELECTION OF MACHINES *

by

J.L. Della Torre**

* The views and opinions expressed in this paper are those of the author and do not necessarily reflect the views of the secretariat of UNIDO. This document has been reproduced without formal editing.

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General Terms of Delivery

EXHIBIT II

(Drafted with reference to the General Conditions of Contract, Document No. 188 A und 730, published and recommended by the United Nations Economic Commission for Europe)

of 1st March, 1963, as amended up to 1st January, 1977

1 Preamble

- 1.1 These general terms shall apply, save as varied by express agreement accepted in writing by both parties.
- 1.2 The following provisions concerning the delivery of goods shall also apply correspondingly to the performance of services.

2 Conclusion of Contract

- 2.1 The contract shall be deemed to have been entered into when, upon receipt of the order, the vendor has mailed his acknowledgment of such order.
- 2.2 To be valid any changes in the contract and supplements thereto require the acknowledgment of the vendor in writing. Any purchasing conditions stipulated by the purchaser shall only be binding on the vendor if they have been specifically acknowledged by the latter.
- 2.3 Offers made by the vendor are subject to confirmation. The offers are made subject to prior sale.
- 2.4 In the event of import licences, export licences, foreign exchange authorizations or the like being required for the implementation of the contract, the party responsible for the procurement of the supplies shall undertake all reasonable steps in order to obtain the requisite licences and authorizations in due time.

3 Drawing and Descriptive Literature

- 3.1 Data concerning weights, measures, capacities, prices, performance ratings and the like found in catalogues, leaflets, circulars, advertisements, illustrated pamphlets, price lists etc. shall be binding only when they are expressly referred to in the acknowledgment of the order.
- 3.2 Drawings, sketches and other technical documents, as well as samples, catalogues, leaflets, illustrations and the like always remain the original property of the vendor, i.e. they must not be reproduced, distributed, published or used for the purpose of demonstrations without the express consent of their owner.

4 Packing

- 4.1 Unless otherwise specified
 - a) prices quoted shall be deemed to apply to unpacked goods;
 - b) goods will be packed in the customary manner in such a way as to prevent their being damaged under normal transport conditions until they reach the destination stated in the contract, such packing to be charged to the purchaser, with packing materials taken back only by prior mutual agreement.

5 Passing of Risk

- 5.1 In the cases listed below, the moment at which the risk passes shall be determined as follows:
 - a) On a sale "ex works" the risk shall pass from the vendor to the purchaser when the goods have been placed at the disposal of the latter. The vendor shall advise the purchaser of the date from which the goods will be at the latter's disposal. Notice to this effect must be given in due time so as to enable the purchaser to take the necessary steps customarily required for the purpose of taking delivery.
 - b) On a sale "ex wagon, lorry, barge" (agreed point of departure), "frontier" or "place of destination", or on a sale "carriage paid up to ..." ("free ..."), the risk shall pass from the vendor to the purchaser at the moment at which the means of transport loaded with the goods in question is taken over by the first carrier.
 - c) On a sale "F.O.B." or "C.I.F." or "C. & F.", the risk shall pass from the vendor to the purchaser when the goods

have effectively passed the ship's rail at the agreed port of shipment.

- 5.2 Unless otherwise stipulated, the goods shall be considered as sold "ex works".
- 5.3 The vendor shall be obligated to arrange for insurance coverage of the goods only if and in so far as this has been agreed upon in writing.
- 5.4 As for the rest, the INCOTERMS 1953 as amended up to the day of the conclusion of the contract shall apply.

6 Delivery

- 6.1 Unless otherwise agreed, the delivery period shall run from the latest of the following dates:
 - a) date of the acknowledgment of the order;
 - b) date on which all technical, commercial and financial obligations incumbent on the purchaser have been met;
 - c) date of receipt by the vendor of such payment in advance of delivery as is stipulated in the contract and/or at which a stipulated letter of credit is opened.
- 6.2 The vendor is entitled to make partial- and advance deliveries.
- 6.3 Should a delay in delivery be caused by the vendor as a result of any of the circumstances mentioned in Clause 10 as constituting a ground for relief, a reasonable extension of the delivery period shall be granted.
- 6.4 Should the vendor be responsible for any delay in delivery, the purchaser shall be entitled to demand either specific performance or, after having granted the vendor a reasonable period of time to meet his obligations, to withdraw from the contract. In fixing a period of grace allowance has to be made for the fact that in the case of special fabrications the vendor may not be able to find any alternative use for components which have already been partly completed.
- 6.5 Should the vendor culpably fail to deliver the goods within the period of grace provided for in Clause 6.4, the purchaser shall be entitled to terminate the contract by the simple act of sending a written notice to that effect to the vendor, both in respect of all goods undelivered and in respect of goods which, though delivered, cannot be properly used without the undelivered goods. In such cases the purchaser is entitled to recovery of any payments he has made both in respect of all goods undelivered and in respect of goods which by themselves cannot be used appropriately and, in so far as the delay in delivering the goods may be due to the gross negligence of the vendor, to the recovery of the expenses incurred by him up to the termination of the contract and in the performance of the latter inasmuch as there is no further use for them. Goods already delivered and goods that cannot be used must be returned by the purchaser to the vendor.
- 6.6 Any claims of the purchaser against the vendor with respect to the latter's default, other than those mentioned in Clause 6, are precluded.

- 6.7 Where the purchaser does not take delivery of the goods at the place and time provided for by the contract for any reason other than an act of commission or omission of the vendor, the latter shall be entitled to either claim specific performance or, after granting a reasonable period of time for taking delivery, to withdraw from the contract.

On appropriation of the goods to the contract, the vendor shall arrange for their storage at the risk and cost of the purchaser. The vendor is entitled furthermore — to the exclusion of any other claims against the purchaser for the latter's failure to take delivery of the goods — to recover any expenses properly incurred in the performance of the contract and which are not covered by payment received.

7 Prices

- 7.1 Unless otherwise agreed upon, prices are to be understood as "ex works" of the vendor, not including packing and loading charges. If delivery to the consignee has been agreed upon, the prices shall not include unloading and handling charges.

7.2 Prices are based on the costs at the time the quotation is made. Should there be any changes as regards costs prior to the time of delivery, the differences are to be charged to the debit or credit of the purchaser, as the case may be.

7.3 Where the prices are not fixed in the contract, current selling prices as prevailing on the day of delivery shall be charged.

8 Payment

8.1 Payment shall be made in the manner and at the time or times agreed by the parties. Unless different times of payment have been expressly agreed upon by the written acknowledgment of the vendor in his acceptance of the order, one half of the purchase price shall be payable on receipt of the acknowledgment of the order, with the balance due on receiving notice that the goods are ready for shipment.

8.2 The purchaser is not entitled to withhold payment because of claims of warranty or other counter-claims not recognized by the vendor as valid.

8.3 If the purchaser falls in arrears in making the agreed payments or delays in meeting any other contractual obligation, the vendor may either insist on compliance with the terms of the contract and

- a) postpone meeting his own obligations until such payment is made and other commitments fulfilled,
- b) demand a reasonable extension of the delivery period,
- c) fix a due date for payment of the entire balance of the selling price still outstanding,
- d) in so far as the purchaser is not able to claim any grounds of release as provided for in Clause 10, recover interest on arrears at the rate of 4% over and above the bank rate charged at that time by the ~~VEICOR'S~~ Bank, such interest to be charged from the time fixed for payment, or, after granting a reasonable period or grace, terminate the contract.

8.4 Should the purchaser — after the period of grace specified in Clause 8.3 — fail to make payment or to meet any other obligation, the vendor shall be entitled to terminate the contract by giving notice in writing. On being asked to do so by the vendor, the purchaser must return to the vendor any goods that have already been delivered and reimburse the latter for the depreciation of the goods in addition to defraying all expenses properly incurred by the vendor in the performance of the contract. As regards goods which have not yet been delivered, the vendor shall be entitled to place the finished or unfinished parts, as the case may be, at the disposal of the purchaser and debit the purchaser's account with the corresponding share of the selling price.

8.5 The vendor retains legal title to the goods until such time as the purchaser shall have completely discharged all his financial obligations. The purchaser is obligated to comply with all required formalities conducive to ensuring the retention of legal title by the vendor. In case of attachment, seizure or other distraint, the purchaser is under obligation to file the vendor's retention of title to ownership of the goods and to notify him of same without delay.

8.6 Claims of the vendor against the purchaser, other than those mentioned in Clause 8, arising from the latter's default are not admissible.

9 Guarantee and Liability

9.1 Subject as hereinafter set out, the vendor undertakes to remedy any defect resulting from faulty design, materials or workmanship.

9.2 This liability is limited to defects which appear during a period of six months in single-shift operation or three months in multiple-shift operation ("Guarantee Period"), commencing from the passing of risk or, in the case of delivery that includes installation, from the time of completion of erection and assembly work.

9.3 The purchaser can only avail himself of his rights under this Clause if he notifies the vendor in writing and without delay of any defects that have become apparent. On receipt of such notification, the vendor — if the defect is one which, under the provisions of this Clause, is to be remedied by him — shall at his own option:

- a) repair the defective goods in situ or
- b) have the defective goods or parts returned to him for repair; or

c) replace the defective goods; or

d) replace the defective parts.

The repair of any defects does not result in an extension of the guarantee period.

9.4 Where the vendor has defective goods or parts returned to him for replacement or repair, the purchaser shall, unless otherwise agreed, bear the cost and risk of carriage. Unless otherwise agreed, the return to the purchaser of goods or parts sent by way of replacement or of repaired goods or parts shall take place at the cost and risk of the vendor.

9.5 Defective goods or parts replaced in accordance with the provisions of this Clause shall be placed at the disposal of the vendor.

9.6 The vendor shall not be under any obligation to defray the cost of repairs carried out by the purchaser himself or undertaken by him unless the vendor has consented to do so in writing.

9.7 The liability of the vendor shall apply only to defects that become manifest under operating conditions as stipulated in the contract and in the course of normal use. In particular his liability does not extend to defects arising from faulty installation carried out by the purchaser or the latter's agent, poor maintenance, faulty repairs or alterations, or those made without the written consent of the vendor by persons other than the vendor or his agent, nor is he liable for normal deterioration.

9.8 For those parts of the goods which he himself has obtained from sub-suppliers, the vendor shall only be liable to the extent of the guarantees granted him by the sub-suppliers. Where goods are made to order by the vendor in accordance with design- and construction specifications, drawings or models supplied by the purchaser, the liability of the vendor does not extend to the correctness of the design but to its execution in accordance with the instructions of the purchaser. In such cases the purchaser is fully responsible to the vendor for all damages or claims that may result from any infringement of patent rights. The vendor assumes no warranty liability in accepting repair orders or orders for alterations and modifications of goods that are not new or have not been manufactured by the vendor.

9.9 From the commencement of the guarantee period the vendor assumes no further liability, save as provided for in this Clause, nor shall he be liable even in respect of defects due to causes existing prior to the passing of the risk.

9.10 It is expressly agreed that the purchaser shall have no claims on the vendor in respect of personal injury or of damage to goods that are not subject of the contract, for any other damage and for loss of profit, unless it is evident from the circumstances of the case that the vendor has been guilty of gross misconduct.

10 Reliefs

10.1 The following shall be deemed grounds of relief if they intervene after the formation of the contract and impede its performance:

industrial disputes and all other circumstances that are beyond the control of the parties, e.g. fire, mobilization, requisition, embargo, currency restrictions, insurrection, general shortage of materials and restrictions in the use of power.

10.2 The effects of the said circumstances with respect to the obligations of the contracting parties are defined in Clauses 6 and 8.

11 Jurisdiction, Law Applicable, Place of Performance

11.1 Disputes arising out of or in connection with the contract shall be under the jurisdiction of the national court having original jurisdiction over the headquarters or the vendor.

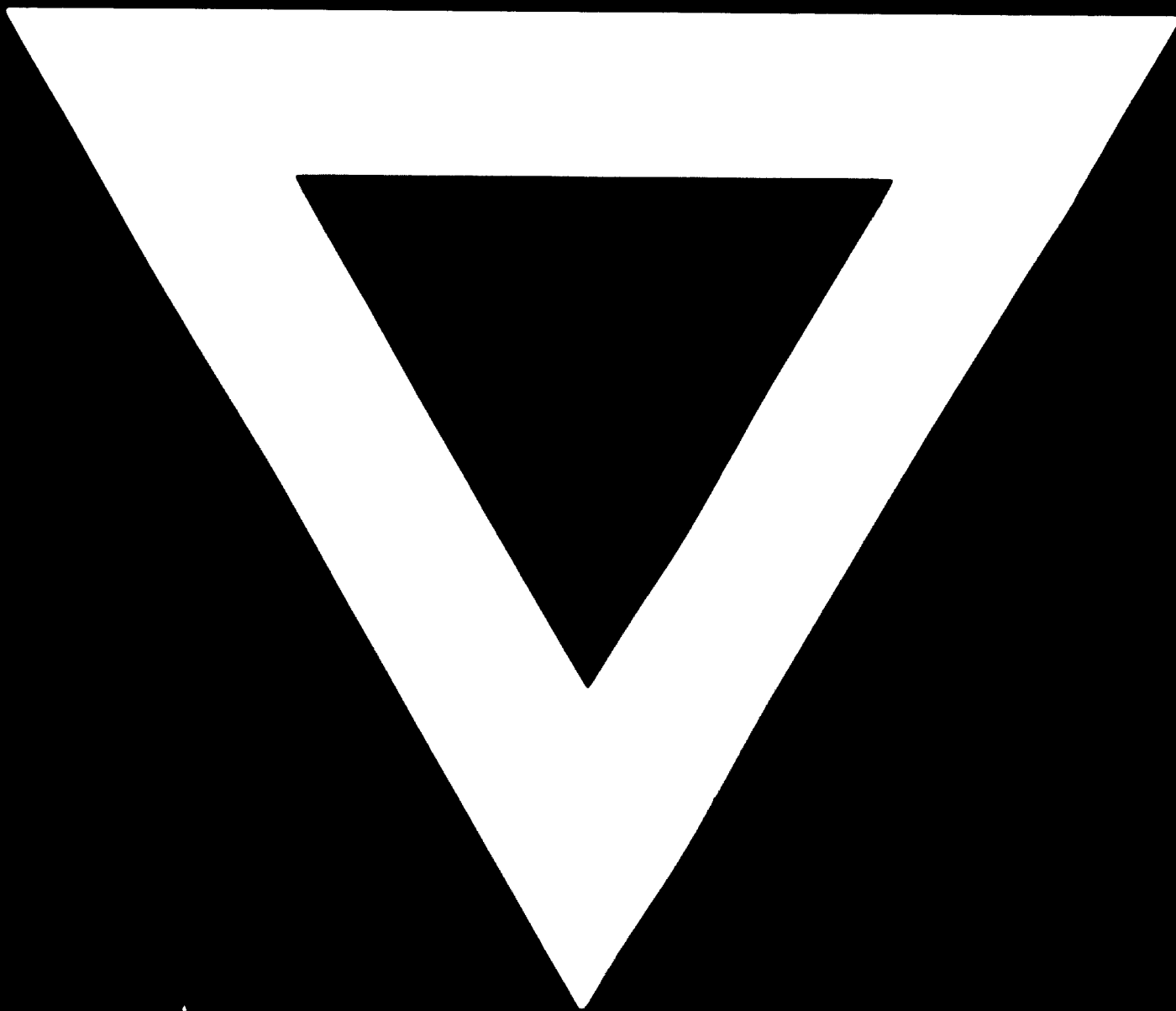
The vendor may also appeal, however, to another court of law having jurisdiction over the purchaser.

11.2 The parties can also agree as to the competency of a court of arbitration.

11.3 The contract shall be governed by the law of the vendor's country.

11.4 The place of the vendor's headquarters shall be deemed to be the place of performance for purposes of delivery and payment even when delivery is — by mutual agreement — made at some other place.

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1. Introduction

In all industrial concerns, whatever their size, purchasing capital goods is becoming increasingly important due to its incidence on turnover, but an extremely delicate task is entrusted to those who have to consider the purchase of machines or systems.

Sophistication of these items has led to increased investment costs and therefore, constant efficiency, especially in mass production, as well as the need for the finished product to meet required quality standards, are only some of the main elements determining economic results. Careful choice is, therefore, of prime importance.

The object of this report is to emphasize, in a general survey, the principles for the choice of machines or systems to be purchased. Specialized principles will appear in later reports on various types of production.

The subjects dealt with are intended to give as much coverage as possible to the processing of logs; above all, notions which are enlarged upon throughout this document.

Whenever the purchase of a machine is contemplated (machine being intended in its widest sense: machinery, systems, servo-mechanisms, etc.) at least the following questions instinctively arise:

- why purchase
- what to purchase
- when to purchase
- how to purchase

Answers to these questions involves treating them as natural consequences of three fundamental purchasing components:

- a) technical-productive
- b) economic
- c) commercial.

In order to reach these conclusions machinery must be considered in two of its qualifying aspects:

Machinery in the productive context.
(Productive entity - dynamic)

Machinery in its intrinsic make up.
(Physical and technical entity - static)

2. The manufacturing process

Considering machinery in its productive context signifies examining a large number of strictly interdependent parameters, difficult to classify in order of priority but all of them important for the optimization of man-machine-ambience system.

Some are referred to below:

The productive process in general

Many wood products may be considered "finished" in those industries making only one product (e.g. plywood) or "semifinished" if they go to make up more complex products (e.g. furniture).

This schemation representation calls our attention to the considerable variety in production parts which, while often having something in common among their various applications, should be considered from different points of view according to whether they go to make up a product with a manufacturing cycle having few or many operations, and even more if production is an integral cycle (e.g. from log to finished furniture).

3. The product

We referred above to the production processes required to transform the wood into saleable products, but the product finds a reason for its existence in the need of the end user, a need which stimulates the market in mutual action and feedback with all the relative problems concentrated in marketing.

For consumer products this means the reality of industrial design (a premise to technical drawing) which, in the light of production facilities and object function (value analysis), appears in the various manufacturing phases detailed in "production cycles". These cycles specify methods as well as the machinery required which, among other things, must be consistent with:

- a) the quantity of parts to be made in the unit of time taken as a reference;
- b) assortment of semifinished parts in production simultaneously;
- c) type of supply: if a work order or for stock;
- d) quality level of the product stipulated for its sale.

4. Size and siting of the factory

- 4.1 Economic resources (finance available, turnover, development programme, etc.)
- 4.2 Personnel (qualifications, remuneration, cost, availability etc.)
- 4.3 Geo-economic area (climate, availability of mechanical energy, infrastructures, availability of raw and auxiliary materials, state of communications and transport, access to purchasing sources etc.)
- 4.4 Organizational structure and its reaction on technical-economic management of resources such as production planning.

5. Production planning

High production costs (direct labour and social charges, material, wear and tear, depreciation etc.) make it necessary to avoid hold ups due to lack of supplies, bottlenecks, accumulation of materials, insufficient equipment, etc., which become liabilities due to space wasting, useless handling, material in stock with interest on capital; all to the detriment of productivity and, therefore, adding to the finished product cost.

It is, therefore, vital to foresee the problems and plan accordingly, as far as humanly possible, to eliminate delays, co-ordinate the various sequences and balance machine utilization to achieve the final objective of optimizing the resources available.

For the more complex cases there are mathematical techniques for Operational Research (linear programming, queuing theory, etc.) which, with the aid of a Data Processing Centre, are able to provide backing for these requirements. In dealing with planning and manufacturing methods, mention must be made of the experiments being carried out which, in overcoming the Taylorian diagrams, with the substitution of elementary operations and monotonous repetition of operations, should increase job enrichment of workers and therefore their major participation and interest. It should also reduce frustration which leads to absenteeism and turnover, factors having a considerable influence on the quality of work and product.

The techniques involved are:

- job rotation
- job expansion
- job enrichment
- group work

Mention was made above of experiments being carried out because not all work study groups are agreed as to the real benefits deriving from this development.

It is a curious fact that in the artisan type of firm, whose numbers are unfortunately decreasing, these techniques have always been used.

The advisability or otherwise of going further into the matter, according to present or future circumstances, is left to the reader. The matter has been referred to here because of its pertinence to the subject under review and the influence it can have in determining production facilities.

6. Layout

In drawing up a processing layout, consideration must be given to the breakdown of the product into assemblies, sub-assemblies and piece parts, to co-ordinate them into the various manufacturing cycles, making them into a common flow diagram which produces the layout with its relative infrastructures. It is at this stage that much can be done to obtain optimization in the use of the machines available. Therefore, the drawing up of a layout is of the utmost importance and must take into consideration the points (a-b-c-d) mentioned under item 2. It is on these points, above all, that the choice depends as to the establishment of:

- fixed layout
- processing layout (areas with homogeneous machines)
- product layout (machines arranged sequentially according to the manufacturing cycle)
- mixed layout (in which the requirements of the processing and product layouts are taken into account simultaneously).

A hypothetical situation worth considering, where applicable, is to build up the layout flexibly by shifting the production equipment from time to time in the sequence most suitable for production flow. Both horizontal and vertical handling outside the machine must always be carefully considered, as well as the direction of flow which should always be positive.

In addition to the correct location of machines, the subject of layout involves the suitable location of the various production departments, stores, buffer stock areas, auxiliary facilities and therefore of installations which are concerned with the layout and availability of machines.

7. Machine features

After having mentioned the context in which the machine will be inserted, we now examine the machine's specific evaluations which imply judgement of its merits as to essential content and competition with similar types or substitutes offered on the market.

Considering machines in a general schematic way, they can be subdivided as follows according to the number of tools and also the number of operations:

- single purpose (for single operations)
- multi-purpose (for multiple operations with movement of tools or of parts being machined in transfer).

According to the intervention of an operator they can be:

- manual
- semi-automatic
- automatic
- numerically controlled.

Although there is a variety of machines available which offer many interesting features some are more distinguished than others mainly because of their sophistication which consists of:

- reduction of direct labour costs
- reduction of tooling costs
- increase in production
- improvement in product quality
- reduction of rejects
- ~~certainly~~ certainty of achieving planned machining times
- possibility of entrusting to one or more persons the task of attending more than one machine simultaneously
- reduction of required floor space