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08965



Distr.
LIMITED

ID/WG.296/14/Rev.1

3 September 1979

ENGLISH

United Nations Industrial Development Organization

Seminar on Wood Processing Industries
Cologne, Hannover, FRG, 16 - 30 May 1979

(2nd)

PRELIMINARY CONSIDERATIONS IN PLANNING CASE GOOD
MANUFACTURING INDUSTRIES*

by

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Introduction

The content of this paper is based on the knowledge of wood processing and the "know-how" of solving these problems. The manufacture of wood products has to be profitable. What does profitableness mean in this sense? The ratio of profit to costs? The ratio value in general is the absolute profitableness of the overall factory. The relative profitableness is considered especially in connexion with individual work places or plant departments. In this case future costs are compared with present costs. Thus profitableness is mostly expressed in figures.

But are figures the only way to express profitableness? In the short-term perhaps, but based on long-term considerations, especially the human being as an individual is of importance. "Feasibility studies" are set up including many tables valuating many different facts, covering statistics and utopia, maximum, ideal, optimum, realistic values.

For example:

A machine is operating with automatic feed of maximum 60 m/min. Investigations proved that no factory can make use of this maximum speed. But why can this maximum speed not be realized?

Certainly it is not this machine but adjacent machines being influenced by this capacity, that means preliminary conditions to solve technical and economic problems are necessary.

A profitable well organized production is based on three factors: labour force, material and machinery. Not the maximum of one factor but the optimum combination of all factors that lead to a profitable production.

1. General conditions for profitableness of production

Under conditions of appropriate infrastructure (roads, power supply, drainage, etc.) the following criteria have to be considered to operate on a profitable basis.

1.1 Production range

Information about the present and the future needs.

- What products have to be produced?
Windows, doors, tables, chairs, beds, wardrobes, etc.
- What quantities have to be manufactured on long terms?
Quantities in relation to time periods.
- What design is appropriate to the material and the need?
Mutual relations between design - material - construction
and their influence to technical requirements are important.
- What qualities have to be produced?
E.g. manufacturing accuracy - tolerances.
Service life - how long should the product be of use? What
standards should be considered?

1.2 Production concept

What production facilities are necessary to manufacture the
production range?

1.21 Main facilities

These are machines and equipment for the production.

- What facilities are necessary for the production?
Range of machines, equipment, in-plant material and
handling equipment.
- What production area is required for transport facilities,
storage areas, transport aisles?
- What factory buildings are required for foundations, height
of rooms, kind of construction, etc.

1.22 Auxillary facilities

These facilities are required to operate and maintain the
production smoothly.

- What supply-plants and environmental plants have to be installed
for electricity, heating, compressed air, dust exhaust, etc.

- What maintenance plants are required for toolings, machines, trucks, buildings, etc.
- What administration facilities are required?
Office building, office equipment, etc.
- What safety equipment is required?
Fire-fighting equipment, water pool, etc.

1.23 Social facilities

- Sanitary facilities: toilets, lavatories, dressing-rooms
- Recreation and community rooms: e.g. cafeteria, kitchen
- First-aid-room
- Training centre
- Sport facilities

1.24 Open air ground

Ground, not covered with buildings and not used for the production.

- Safety areas, e.g. fire safety space between buildings, distance to roads, etc.
- Lawn
- Parking area for cars of employees, customers and suppliers
- Transport for material, delivery of products
- Expansion areas

1.25 Plant layout

For evaluation of the quality of a concept a detailed draft layout (scale: 1:100 or 1:200) has to be prepared.

1.3 Factory organization

All operations in a factory have to be planned and controlled. For that purpose are necessary:

- Job assignment plans determining the jobs of the work places and the personnel.
- Production Flow Charts determining how the jobs have to be done according to which method.
Who does at which time which operation?

Which information is necessary (drawings, stocklists, form sheets, working times, etc.)?

What controls are necessary (working time, quantity, quality, etc.)?

- Equipment.

Typewriter, calculating machine, drawing machine, copying machine
planning boards, etc.

- Factory statistics.

To perform an optimum planning for future production periods, face values and knowledge of previous periods have to be considered. To ensure the profitability of production characteristic values have to be listed statistically, e.g.:

turnover per employee

turnover per period

wage ratio on turnover

production time

administration costs ratio on turnover, etc.

1.4 Personnel planning

A certain personnel structure is essential for each industry operation. Personnel is required according to different qualifications and different functions (need of personnel). When the manufacturing operation is well planned it is easy to classify the personnel for the job.

- What personnel of a specific qualification is required?

For the start-up phase and for the initial operating phase?

- What personnel training is required? e.g.:

short-term: instructions

long-term: courses

1.5 Identification of profitability

At the end of the planning phase and at the beginning of operation each investor has to prove the profitability of the investment. It is natural that at this point no data are available for the necessary investments and final capacity of the plant. That is why profitability

calculations before accomplishing a project can only be an orientation to facilitate a decision for final results.

The investor has to realize that final results cannot be obtained before the end of the start-up phase (approximately two years).

It should be noted that capital is not only required for the necessary investments but also for the raw materials, semi-finished and finished products as well as outstanding debts.

2. Profitability considerations on small-scale case good production

Small factories manufacture for the demand of the local market.

- Utilizing materials available in local areas (raw material, semi-finished products)
- Manufacture of products appropriate to local market requirements.

2.1 Product range

There are two possibilities to determine the manufacturing range:

- The specialized product range or the universal product range.

2.11 The specialized product range:

That means manufacturing only one product or one module or standardized product, viz: chairs, tables, windows, doors, mouldings, coffins, etc. These ranges are convenient if special products find a sufficient consumer market in the local market. It is not advisable to serve far reaching areas because large-scale factories are in a position to produce these products on a more profitable basis with a better system of sales distribution, centres. Moreover, specialized products are manufactured more economically only in large batches, which require machines and plant systems according to design, material, construction and quality of the products. These plants finally determine the production capacity and so the profitability size of an industrial operation.

2.12 The universal product range

- Manufacturing of all kinds or many different kinds of products should be possible. This is typical for small factories.

- It is very difficult to outline the capacity, e.g. determination of personnel capacity in the production sections, resulting in the total number of personnel.
- Selection of some representative goods (standard goods) and fixing batches per period.

2.2 Concept of production

2.21 Small-scale industries

The same considerations as for large-scale production are generally suitable for special production ranges.

2.22 Medium and large-scale industries

The following considerations are necessary for a universal product range in small-scale industries:

Material section:

- Combining materials into material groups, viz: solid wood, veneer, wood based panels, etc.;
- Determining the supply conditions of material, viz: dimensions, moisture content, etc.;
- Investigate ways of supply, viz: quantities, transport, efficiency of suppliers;
- Determining the storage capacity.

Manufacturing section:

- Determining individual operations. First of all grouping of operations: cross-cutting, moulding, pressing, etc. and then sub-dividing main operations: moulding, shaping, grooving, tongueing, rebating, etc.;
- Determining machines and equipment, viz: vertical boring machine or horizontal boring machine, etc.
- Technical data: width, height, toolings, control-systems, etc. This kind of production requires basic machines only. To be selected in view of:
 - simple handling;
 - simple maintenance;
 - same spindle diameter;
 - standardized spare parts, etc.

- Layout of production flow. Graph showing process flow for different materials.
- Operation (see Annex I). Operation sequence chart: operations and appropriate equipment.
- Calculation of machine numbers according to capacity data (Annex IV). It is not possible to carry out an exact calculation, which can stand for long terms, if the production range will be changed. The required number of machinery is based on the above mentioned calculation and experience. Full capacity of all utilization machines and tuning of machine capacities cannot be realized at 100 per cent. It is important that all required production machines are available. Within the production flow there should be a bottle-neck because of under-capacity.
- Calculation of space for all machinery and equipment as there are: space for production (machinery, work-benches, etc.); operation space (for the operator to handle the plant and to accomplish his operations); storage areas for prepared work piece raw material and for finished work pieces).
- Calculation of raw material storage, intermediate storage and shipping storage areas.
- Determination of auxillary plants.
- Determination of social facilities.
- Drafting the plant layout (buildings and equipment). A good plant can be judged by: convenient sequencing order of working places (operations); shortest conveyance of material, etc.

Note: Important for project comparisons are requested offers, based on a draft layout. "PRESENT A LAYOUT BEFORE REQUESTING AN OFFER". Offers based on different plant layouts are not comparable.

2.3 Organization

- General office equipment (simple kind)
- Production planning and production control

Equipment: drawing machines, blue-print machine, material filing cabinet, operation control board, typewriter and calculator, copying machine, etc.

Formsheets: Stocklist of parts (see Annex II)
Component operation sheet: (see Annex III)
Operation time schedule if pre-planning and control has to be carried out.

Note: Production planning and control for this kind of operation in small-scale industries is under supervision of the chief operator.

2.4 Personnel

- All operators have to be skilled labourers with higher qualification
- This type of factory provides the best facilities for primary and secondary training.

2.5 Profitability

In addition to the profitability notes under "Introduction" it must be stated:

Product manufacturing rising to the comprehensive demand for various demands offering good offers a versatile possibility for basic training of labourers and supervising technicians which is of importance in developing countries where specialized training is not available.

3. Profitability considerations for large-scale case good factories

This relates to well organized batch production and mass production. Considerations under item 2.11 are the same for medium and large-scale industries, but the manufactured bulk will cover larger market areas.

3.1 Product range

- The products and groups of products have to be defined exactly, e.g. bedroom furniture, kitchen cabinets, chairs, doors, prefab houses, etc.
- The production capacity has to be fixed. Which batch sizes should be produced in a certain time (per year, per month, daily).
- The design has to be defined to prepare construction details, e.g. solid tipplings or edge bands, etc. Future expectations in the design have to be clarified so that construction details resulting from different designs can be standardized.

- Quality requirements have to be stated; tolerance range, standards, module sizes, etc.

3.2 Concept of production

In large scale operations an exact capacity co-ordination of all machines and equipment has to be carried out. Failures in planning and investment can seldom be amended at the final stage. If the production range and construction details are fixed the following steps are necessary for a good concept.

- 3.21 Preparing the component development chart (see Annex IV).
A product is sub-divided in view of operations so that the manufacturing process can be defined.
- 3.22 Stocklists will be prepared according to component stages (see Annex II). The stocklist also includes all component groups and components with quantities and component sizes.
- 3.23 Operation sequence charts (see Annex V). All operations of components are listed in logical order (horizontal columns). The component stages are arranged vertically. All operations for component groups and components are fixed in order of sequence. So the operation sequence chart demonstrates the component development.
- 3.24 The evaluation of the operation sequence system results in the machine (operation) capacity according to the product to be manufactured (capacity analysis).
- 3.25 Determination of machines and equipment with required technical data.
- 3.26 Calculating the size of intermediate component storage and finished product storage areas. Capacity is not only a function of machining but also of sufficient stock and intermediate storage space.
- 3.27 Determining conveying equipment and size of conveying aisles.
- 3.28 Determining type, capacity and size of auxillary equipment.
(see item 1.22, 1.23, 1.24).

3.29 Drafting of plant layout. Scale 1:100
Preparation of alternative layouts in order to establish an optimum solution.

Note: Project-concepts for tenders should never be worked out by project suppliers but should be worked out by consulting firms. Avoid layout offers from machine manufacturers. In this way tenders can be compared with each other.

3.3 Organization

Here, only the organization of production planning and production control is considered.

- Control unit:

An effective organization is based on a central control-unit consisting of:

- Product planning board for pre-planning operations;
- Control board for processing, checking that means distribution and control of operations;
- Phone system for mutual information between control team and machine operator;
- Copy-machine to print organization forms;
- Material file in order to register and dispose of materials.

- Operation times:

Information on operation times are important for a good running manufacturing process.

- Forms:

Forms are based on:

- Product drawings
- Component stages
- Stocklist of components
- Operation sequence chart

These items will help to work out the following form sheets:

- Component operation sheet derived from operation sequence chart
- Material forms derived from stocklist of components
- Flow-charts, target date-forms, wage-forms, plan-forms, derived from component operation sheets.

Note: The whole process of production is controlled by the central control-unit.

3.4 Personnel

The required personnel can be calculated exactly according to planning and organization of the production. Personnel with special qualifications is required, not universally, but special skill is essential.

Knowledge and skill can be achieved relatively fast. A broad differentiated management is necessary because of different management levels.

It is very convenient to establish training sections for unskilled workers.

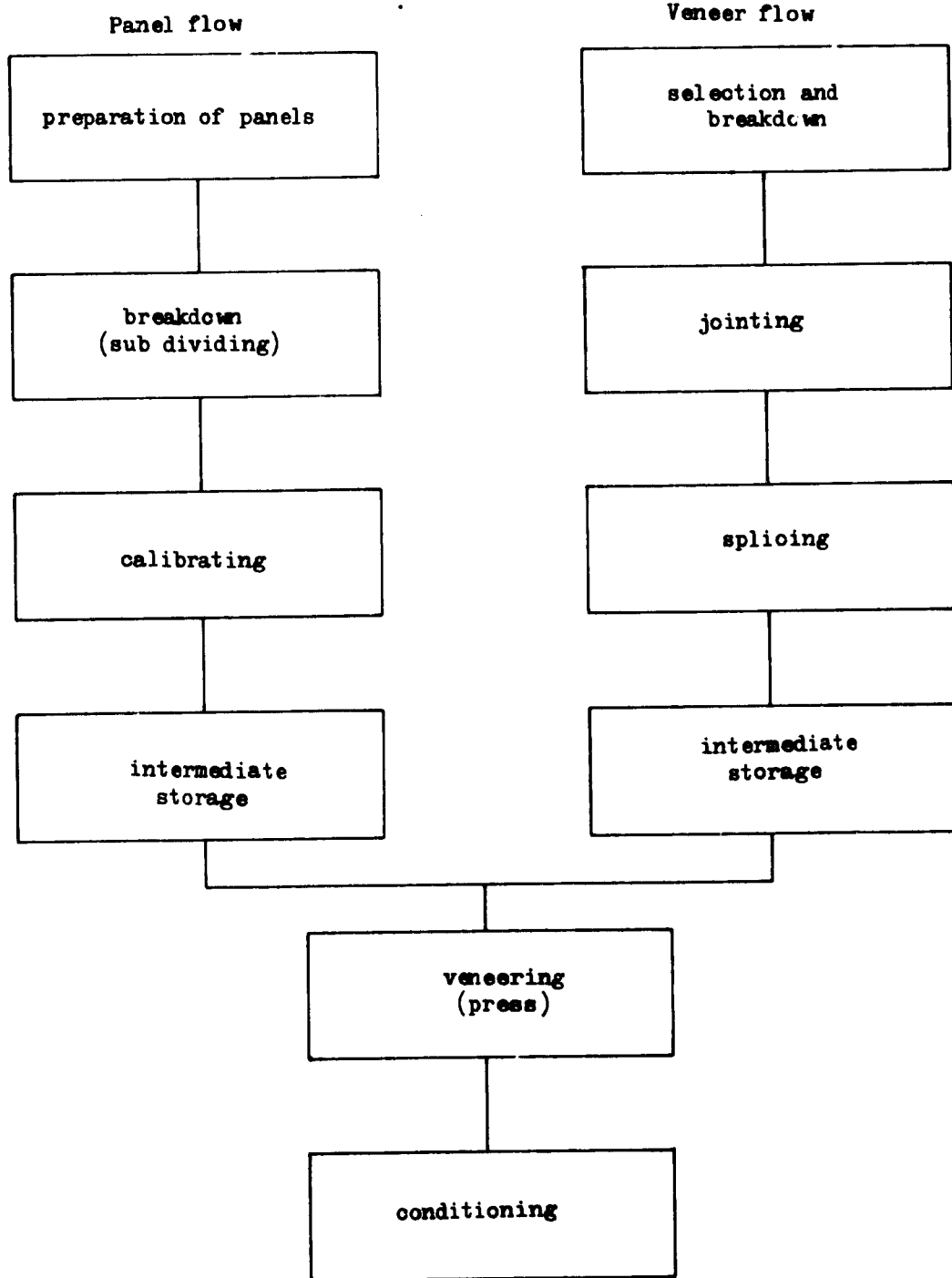
3.5 Profitability

The profitability can easily be pre-calculated. For that purpose, in most cases available.

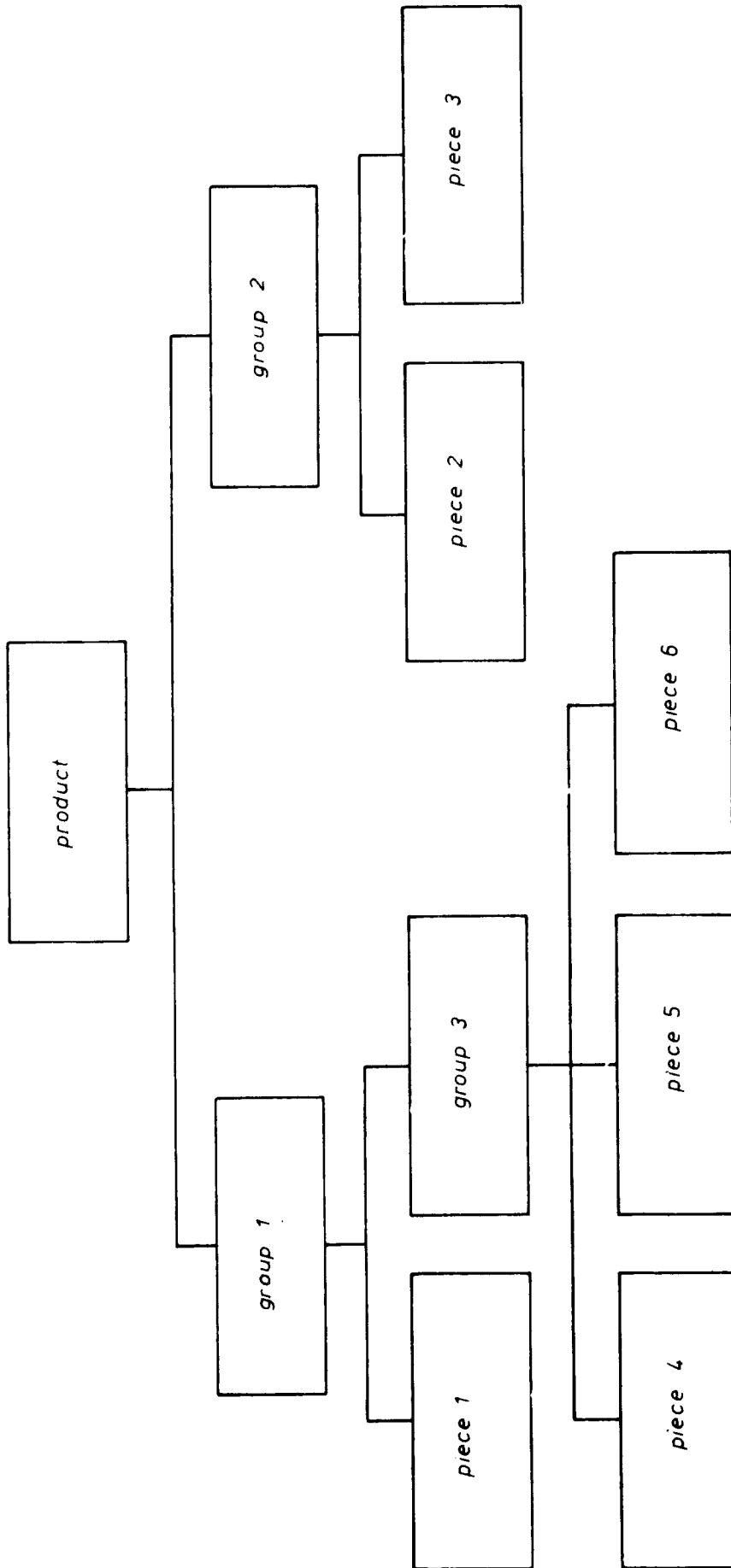
4. Summary

1. Setting up a production range.
Which products should be manufactured?
Type, design, material, construction.
2. Fixing the production capacity.
What quantities per period should be produced?
Number of staff to be employed?
3. Setting up a general plant layout for a well established operation.
4. Preliminary statements on the profitability based on estimated values for investment decisions.
5. Preparation of tenders.
6. Request for different offers, either for the whole project or only for parts of it.
7. Carrying out detail planning.
8. Final calculations on the project profitability.
9. Project realization.
10. Establishing production data and records (at the same time when setting up the project).
11. Personnel planning (at the same time when setting up the project).
12. Production start-up.
13. Proving of profitableness.

OPERATION FLOW CHART

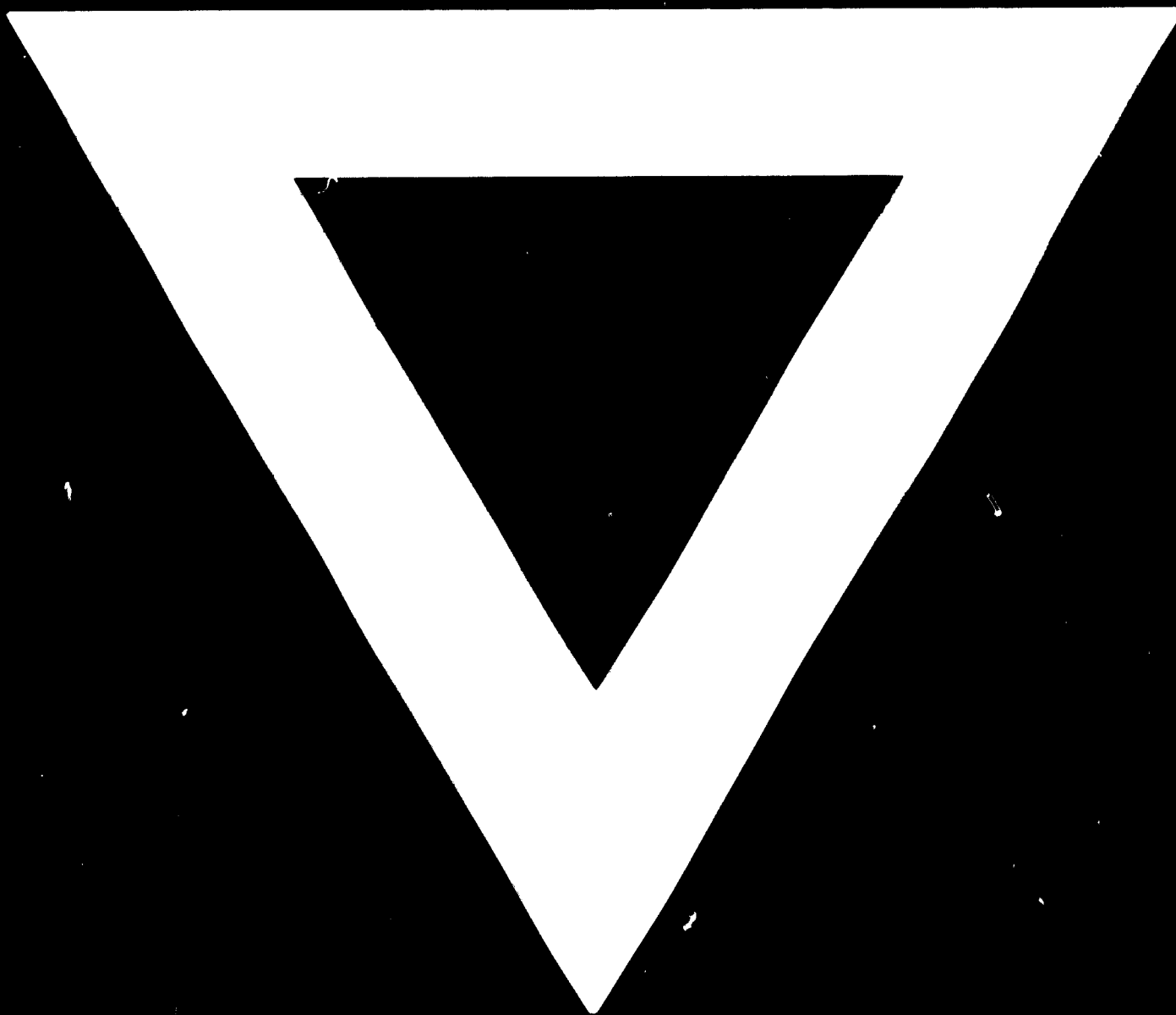


COMPONENT DEVELOPMENT CHART



Group Item and workpiece items to be transferred to operation sequence chart

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