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EVALUATION OF A PLANT FOR THE
MANUFACTURE OF SEMI-FINISHED PRODUCTS*

by

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I. Marketing and Sales Organization

The opening of business relationships with companies in foreign countries and continents, can be a major problem during the early stages of negotiation. It is much simpler to deal with the import and export companies and for many articles dealing with a middle man or commissioner suffices but as soon as an article reaches a large production complexity it is necessary to deal directly with the customer. When making direct business connections it is necessary to plan a specific marketing system and to develop a corresponding sales organization. Such a sales organization is best constructed if one works parallel to the existing sales methods and at a future date depending on the experience attained to carry on building up ones own sales strategy. Aside from this it is important that the manufacturer gives his attention to the mentality of the buyers and not the other way around. This attitude towards the buyers aids in reducing any uncertainty the buyers might feel towards the manufacturers. One must understand that from the buyers point of view a certain degree of distrust is shown when dealing with deliverers of semi-finished parts, which originate in overseas countries. Finally the buyer on ordering semi-finished products has to rely on punctual and correct delivery in order to be able to produce with these parts, the finished product by his scheduled date line. These feelings of uncertainty on the buyers part cannot be transmitted either by verbal or written explanations, as in this instance the buyer can only go on his own experience. The build up of experience is initiated as from the first correspondence exchange between the buyer and manufacturer. In this correspondence the manufacturer assures that from his side no delays under any circumstances should occur, which also applies to the carrying out of the orders and the delivery of the product and under these circumstances when negotiating with overseas buyers and suppliers a feedback system should be followed up with the customer.

The manufacturer should be informed beforehand of the requirement of his semi-finished products, be made aware of new developments, changes and also be fully aware of the stock depletion of his parts.

Happily the National Institute of Manufacturing countries also supports the sale of products from their own countries. Through such institutions it is made easier to organize cost intensive exhibitions and world wide business connections.

The build up of specific sales methods for various products produced en masse is systematically variable to articles made to order. The sales methods for these articles e.g. mouldings, parquet, panels, etc. generally exist in basic form and require only relevant elaborations and adjustments. For individual products made to order there is no set sales method, although normally it is these articles which bring a large open market, for example semi-finished products for furniture, upholstery, veneer decks cut to size, frames, etc.

Furthermore, throughout the development of sales methods it should be noticed that no one specific method is followed for all products but that each manufacturer will employ his own sales strategy. The analysis of sales possibilities of semi-finished products in the various countries is aided and abetted by government statistics which help and are taken into consideration with further market research which should be based on a general knowledge and awareness of the countries own marketing and social structures. The specification and potential, as well as all details concerning the customs duties and regulations should be thoroughly gone into.

The newly constructed sales organization will find with almost all articles that there is a strong buyers market in the industrialized countries. The semi-finished parts as demanded in these particular countries, can be produced, at least from our branch in sufficient quantities in these countries themselves, in which case the sales methods come into a competitive bracket and in order for this market to exist the prices for the semi-finished parts must be lower than the prices of comparable articles. A better manufacturing cost output for the semi-finished parts in the raw material countries is encouraged by subvention and lower personnel costs. These lower personnel costs would be partly equalized through the employment of more personnel, with reduced freight rates, and a higher percentage of sales. It is

therefore imperative that the manufacturer, apart from other cost reducing steps ensures that the optimum utilization of material is obtained.

This is explained in more detail in the following:

Next to the prices, there are other criteria to be watched which could also affect the decision making of the customer:

- Optimal customer relations
- Delay free business procedures
- Time scheduled deliveries
- Correctness and quality of the delivery
- Proof tests and quality control of the semi-finished parts on behalf of the manufacturer
- Active help and advice with problem solutions.

The expenses involved in marketing and developing a sales organization are great and should definitely not be underestimated when carrying out a feasibility study.

II. Production Programme and Production Design

It is recommended as being simpler when commencing a production programme and production design to use a ready example. However, as the semi-finished products cover such a wide range in our branch, e.g. flooring, chairlegs, veneer decks and various semi-finished furniture parts, this statement should be kept general.

If the production programme covers articles that induce high production expenses, in the low salaried countries there are definitely competition advantages in the offering. Some of the advantages resulting from such a programme could be:

- Lower freight rates due to intensive work processing
- Better utilization of the raw materials.
- Maintaining the same quality.

The programme combinations should be selected carefully in order

to obtain the maximum possible use of the raw materials as this is one of the largest cost factors in the manufacturing process.

It must however also be considered in the programme that the wood being worked with will always vary in quality which means that the production programme must include articles of high, middle and low quality grades. With this in mind a favourable range of saleable products should be achieved which are suitable to the production and marketing requirements. In combining these different qualities the use of substitution woods is employed in place of the better known whole wood species.

In the raw material countries there is less point in working out corresponding research in the field of bringing in semi-finished parts onto the market. Substitution wood is very necessary for the successful installation of a plant for semi-finished products as even in the countries rich with raw material, the production of complete single products is uneconomical for the future outlook.

The design of the semi-finished parts should relate to the buyers wishes although the basic construction hidden behind the design is often left up to the manufacturer. Here there is great scope for the maximum possibilities to be used in economical constructions corresponding with the production possibilities for the product. Following this aspect, the manufacturer should try and keep to a basic standardization e.g. DIN Normen or ISO Normen.

It is recommended that a proof test be made on the chosen construction with the relevant chosen quality in the country of origin, and special attention should be given to all construction criteria, e.g. part exchange possibilities through damaging, usage of left and right hand fittings from the symmetrical design of the products on an 'X' and 'Y' axis, the stability and duration of joints and the speed and simplicity of the assembling methods.

Of greatest importance to the customer is that the product he requires is always manufactured to the same quality. This should be checked and regulated through inter factory quality control.

III. Technical Equipment

It is of course also possible to buy a 'turn key' plant for the installation of a manufacturing unit for semi-finished products. This can be obtained with written confirmation that a certain quantity of certain quality goods can be produced. This turn key plant is mostly used in large manufacturing concerns and generally has only one production factor. Other production factors surrounding this should have prior attention. This means that using a 'turn key' plant as a large production factor is over proportioned in a beginning phase. The actual production amount depends on all production factors and not simply on one 'turn key' production amount. These types of production units are often caused to work under extreme pressure in having to keep up with the required capital intensity which often causes a difficult factory atmosphere which can often prejudice and hinder further development as seen in many examples which only normalize after several years.

It is therefore recommended that on equipping a new factory which will be producing wood parts a very slow development is planned. Starting with a small production will definitely not bring vast production figures therefore all interfactory production factors should culminate into scaleable and ascending proportions. On this basis it is easily possible in the course of the development to alter the methods of production and to change over to other ranges of products should the market demand it. If one sets out with simple machines, generally second hand it is a much easier task to instruct the technical personnel in the handling of the machines and the wood. They can be instructed in running repairs, how to overcome bottle-necks, to compensate through production blackouts, to construct devices and to obtain technical know-how.

All this can be supervised and achieved without the added risk which would arise with highly specialized and new equipment.

Similar experiences can be made in the organization, the quality control, the factory supervision, the accounting department and last but not least in the marketing and sales organization.

For those who are used to participating in this industrial process and equivalent frictionless functions within interfactory structures it is then only a short step to extensions and improvements which can be made with the most modern equipment. Few problems will be encountered with such a change-over and the older machinery and equipment can still be put to use in dealing with special orders or being used in supplement lines.

Technical equipment not only covers the actual production machines but all supporting equipment such as the boiler plants, sharpening shop, dust extraction, installations for electricity, compressed air, etc. The planning and buying of this equipment is often badly neglected, or the equipment as standing is of the wrong dimensions for the machines in the production line. The supporting equipment should be planned so that at a later date an extension can be added with minimum problems, e.g. space must be planned for a second compressed air station, the chip silo must be placed to the side of a possible hall extension, apart from which the supporting equipment must be centrally planned so that the shortest possible connections can be made to the consuming machines.

The cost of these connexions and the installations are very often underestimated. With the wood working machines it should be taken into account that 40 - 60 per cent of the total value of the machine will be required only for connecting the machine.

It is furthermore important with the supporting machines to ensure that they are absolutely reliable in operation. The majority of wood working machines, for example, will no longer work if there is failure in the compressed air system, therefore provision should be made with smaller stand-by aggregates, the same also is applied in the instance of electricity failure through which irretrievable damages can be caused on various machines, e.g. glue applicator or similar, which are factors taken into account completely separate from the loss in production.

As all wood working factories have high flammable risk, attention should be given during the planning stages to the installation of passive securities, e.g. highly inflammable areas should be separated from other buildings, such as the chip silos, laquering

shops, contemporary precautions such as factory fire brigade, water pipe placement and fire hoses should also be given top priority attention.

It is often found that on the main machines, very high guarantees for output and quality are demanded and all secondary equipment and production factors are neglected. This mistake should be avoided at all costs, the secondary supporting equipment should be given greater importance.

IV. Transport Flow and Work Place Organization

There are various possibilities in the transport arrangements concerning semi-finished wood products. In every factory a definite transport system should be decided on and kept to so that in each factory no mix-up of transport mediums occurs.

There are a few given standard transport methods, which in the wood industry are, pallets, wheel pallets, carts, fork lift trucks and gravity roller conveyors. In some cases conveyor belts can also be used.

Depending on the distances in the transport system, the production quantity in relationship to the buffer area and various production steps, these transport distances must be checked for their feasibility. It can generally be said that in the wood industry, gravity roller conveyors are of the best value. The transport mediums should guarantee a passive security against damage and all transported goods should be moved safely and easily to their destination. Important when planning a buffer area is the fact that there must be room to breathe to allow the buffer stock to increase as well as reduce.

Further attention should be paid to the time taken to change a stack in front of the wood working machines. This should be kept to the shortest possible limit which assists the wood working machine in being used to its full capacity. After every wood working step a quality selection unit should segregate the various qualities to enable them to be moved via the transport mediums to the different work places and also to be collected.

Apart from this, with such a transport medium, the relevant surrounding organization should be planned, e.g. if a roll of red foil is required by one machine at 15.00pm this roll should have already been transported beforehand.

The buffer areas and loading zones should also be well organized in this way. On planning transportation mediums, notice should be paid to the use of rolling transport where a smooth floor is required.

A flat concrete floor is sufficient when using gravity roller conveyors. When using fork lift trucks, large movable loads should be considered during the construction period in the different working areas, raising platforms are recommended which relieve the heavy hand-work of lifting and lowering the parts. For stacking the boards more efficiently stacking devices or stacking walls are recommended. It will be necessary in many cases to use extra transport either at the beginning or the end of production, e.g. in the production, gravity roller conveyors and either the beginning or the end fork lift trucks will have to be used. It is important in this case to ensure that the transport flow of parts carries one from one to the other without interruption and for this relevant devices have to be installed at different stages and positions. With small devices, many working places should be arranged more effectively, with this in mind and improved arrangement of the machines and transport mediums, efficiency can be improved up to 40 per cent.

Carefully positioned work place arrangements corresponding to a constructive device making shop, can with very simple machines, also encourage production output. Standard wood working machines can also be linked up through simple devices. Through such provisional work place arrangements the manipulation time per part is considerably less and therefore the costs induced on this part are reduced.

Further, security provisions are also necessary for each working place, for which every country has its own regulations. Added to these regulations an important factor is the elimination of noise.

Therefore soundproof housings which can be made on the premises should be installed.

Such steps in the work plan arrangement, not only improve the productivity, but also improve the factory atmosphere and the motivation of the personnel.

In many factories the arrangements of the work places and the transport systems and flow leaves much to be desired, and could be improved from 10 - 40 per cent with only minimal investments.

V. Production Documents

It has been discovered through research that the daily occurring problems in production are normally only minor technical ones. Technical problems appear to represent only 15 per cent with the remaining 85 per cent being information problems. In order to avoid this the production documents should be planned very carefully so that all information is set down in comprehensible form for those who are involved with distribution. Factories which only have one article being produced over the entire year will surely manage without the necessary production documents.

It is, however, essential to have differentiating production documents in the cases where the range of products consists of many parts and production phases and also combines the different qualities. This is even more so where orders have to be repeated or the product is manufactured to order when it is imperative to work out standardized production documents. The production documents should be set out so that one knows exactly where to find exact information over any one stage as that stage is reached. This system enables all details to be covered and reduces the amount of mistakes made from the beginning. The standardizing of the production documents should begin with the drawings and where possible the size of the drawing should be stated as well as the methods to use for the particular piece. A typical format for this is the much used DIN i.e. ISO-Normen.

For the production, detailed drawings of the single work pieces should also be drawn up. The single part drawings should be drawn

so that the personnel on the machines can do the necessary set-ups without any problems. On the complicated machines, e.g. the large dowel machines, it is more favourable if detailed drawings and diagrams are done so that the machines can be set up in a very short time according to a definite co-ordinate system.

This system is of course applicable to every machine and it is, therefore, important that a 'zero-line' is laid through the machine. All set-ups are followed through with the help of this 'zero-line' so that on completion of the set-up only two or three work pieces have to be controlled before the production can commence.

In order to control the measurements according to the drawing, it is recommended that jigs be used. These can also be made on the premises. In order to have the jigs immediately to hand throughout the setting up processing, a list is compiled of all the jigs required in their order of use, which is hung up with the jigs themselves alongside the machines for easy availability.

Particularly important are the production documents relating to the cutting up of the raw material. When cutting the solid wood, the cut cannot be exactly planned beforehand due to the quality of the wood and the various faults that will be encountered in the wood itself. The cutting list should be laid out leaving sufficient room for the people on the cutting machine to use their own judgment in selecting the pieces required. For example, lengths of wood of good quality should not be cut further simply by following a list, these should be retained and added to the amount of length boards required; this also applies to the quality of the boards and by doing this the utilization of the material is improved. When cutting boards there are restrictions regarding the size of the raw board and in order to avoid too much waste it is necessary to work out a cutting plan suitable to the capabilities of the machine. It is, therefore, sometimes necessary to assemble different parts from different orders together in order to get the full utilization of the raw material.

For the assembling and final processing of the parts it is necessary to have the production documents lined up in the same sequence as the various production steps. Importance should be given

to the checking of the number of manufactured parts against these documents and that the quality is controlled through the inter-factory quality control station and also noted down in the documents.

After the manufacture and packing of the parts, different documents are necessary which cover the assembly of the products for one container, so that this container can be sent off without any time delay. The planning, working out and practice of such documents generally require a great deal of time as all personnel involved have to become thoroughly familiar with all the relevant processes. Despite this, the production documents greatly reduce the amount of waste material as the cutting line can be reduced and the quality of the material can be better utilized to such an extent that in many cases a saving on material of between 5 and 25 per cent can be obtained.

Licence holders, members of a Franchise system, or members of a joint venture benefit in this case as they can often rely on the experience of their partners.

VI. Production Planning and Production Control

A great many factories have proven that they have no knowledge of production planning or production control. When orders are received, the purchase material should be immediately processed. With this system there can only be improvements especially when the material costs are of main importance. For future production planning it is important to be aware of which products will have to be produced which is where market analysis data is very necessary. From this analysis important prognosis should be determined to help with the production planning, where it can be seen which material will be required and which quantities will be required for the future product. For the production planning this can mean that a certain quantity of the present demand has to be eliminated from the production and collected in the store over several months in preparation for the anticipated demand, which can then be immediately satisfied. This method makes much better use of the material. Optimal utilization of material is only one criterion in the production planning, which

has to be orientated on and around the optimal material flow and the factory running itself. There should be no delays or hindrances on or around the machines and the buffer area should never be over filled.

It must always remain of extreme importance that the machines be used to their maximum.

The production planning which is worked out for production processes can occasionally be disturbed by inter or external factory interruptions. This will lead to replanning or changing of the production process.

Many productions have failed at this point from lack of the necessary flexibility for replanning and changing of the production process in the case of interruptions.

In order to control the production as it is planned, capacity calculations and some production factors as well as a time schedule are required. The effectiveness and correctness of the time schedules is not always left up to the organization mediums or methods to be decisive factors, but the production planning and control rises and falls with the elaborations of the factory data, without which the best production control is also useless. In order to obtain this data, feedbacks to the production planning are necessary. From these documents it is possible to determine future tendencies for the time scheduling. The time scheduling is of utmost importance in areas that could possibly create bottle-necks in the factory. This does not only apply to the production machines but also the production planning and the work preparations. On the other hand, time schedules should not be worked out in too detailed form, but concentration should be centred on the main machines and the main departments. It is often possible to plan the capacity at the beginning of a processing line, e.g. by veneer cutting or board cutting, cutting of solid wood or at the beginning of the laquering and also at the beginning of the assembly. On the assumption that everything that has been cut can then be further processed, it is not necessary to plan the processing steps in detail.

With articles requiring intensive work it is not advisable to plan with personnel instead of machines. Production planning and production control is necessary in order to reduce the factory costs and to satisfy the customer with deliveries kept to the time schedules.

VII. Evaluation of Production Costs and Calculations

Costs ascertained in the calculations consist of two different data groups which must be worked out in different ways. On the one side the technical data in the factory and on the other side the data from the accounting department and the financial department.

Experts, with experience in both areas, in the technical and also in the accounting and industrial engineering fields are very much sought after in the industrialised countries. In the raw material or developing countries they are hardly to be found.

In most cases a very exact accountancy department is existing but technical reference is missing. The cost compilation from the accounts is not acceptable in this case as the calculations are done after a time lapse from the finalization of the products. On top of this the calculation is not based on a single product. When compiling the costs for one single product, exact data must be obtained from the technical department, the compilation for one article is generally easily obtained. It will be more difficult to calculate the waste and still more difficult to obtain a detailed processing time, as mentioned before the organization must obtain this data with sufficient exactness and with no time lapse, direct from the production document. After the compilation of all direct costs the overhead costs can be calculated for the different products.

The accounting section should also state overheads from fore-going periods. Under these circumstances the cost compilation from single products is possible. If there are any products taken into consideration that have not yet come under production it is then necessary to have a separated extension of this cost compilation.

The data from the production has then to be reduced to basic data to be used as base for the new product. Such basic data could be the following:

- cost for the cutting and slicing of one square metre of veneer
- cost for the cutting of one square metre of chipboard
- cost of one square metre of laminated chipboard with veneer
- cost for one running metre of moulding

The overheads which are indirectly compiled from the costs should not be based on a previous record. It is always better to establish a costing system for the future for when the product comes into production. In this costing system all types of costs for the future period have to be budgeted, and from this the corresponding overheads are calculated. It is only with such a calculation that the exact cost for a semi-finished product can be determined and this price can be compared to other market prices. Only this exact comparison can influence the decision towards further steps, e.g. if this semi-finished product is of interest to the company or if the price can be temporarily reduced in order to introduce the part onto the market, concessions have to be made in order to obtain a profit margin in comparison to other products.

This information is for the production and budgeting politics of the company and is to be considered of main importance.

As a side effect a detailed cost compilation of a factory will bring many faults to light which can be remedied.

VIII. Management and Personnel

It is always a problem to find reliable personnel. The non-functioning of newly established factories has many of its basic problems due to unqualified personnel. The larger the new commencing factory is, the larger the personnel problem. The company can only begin to function properly when the production factor of personnel in the organization and the technical equipment have become

united into one functioning group. It has been proven that 30 people are more likely to achieve this much faster than 300.

The psychological approach to personnel must always be taken into consideration. In industrialized countries it is definitely possible to raise production on offering a raise in salary, but in many other developed countries this would have little effect as the raise in salaries would not be compensated by the consumption of the articles. In this case other forms of motivation have to be explored. These facts should already have been foreseen during the planning stages so that arrangements could be made, e.g. factory accommodation, medical aid, entertainment and social functions, apprentice training, etc.

Management systems which depend on working together co-operatively, generally fail in newly built companies in developing countries. The fault generally lies in missing facilities and also more to the point that such a system is forcibly imposed on the people concerned. A more successful system in such cases is one that relies more on the patriotic feeling within the organization which in most cases exists within the social structure.

In a newly built company the management should already have extensive experience with the products being made and know the products very exactly as well as having the corresponding know-how, that also applies to the highly technical machines and equipment which are often installed at the very beginning.

The operating personnel should also have experience with the installed machines and should be fully aware of the machines' possibilities for the production process. Apart from that it is also very important that they have a theoretical background knowledge and that they are also aware of how the machines have been designed and built in this manner, i.e. the operating personnel of a thick-nesser have to know the actual possibilities of their machine, e.g. largest possible width, largest possible height, feeding speeds for certain required qualities from the different types of wood, how and when the tool set up has to be changed, how to carry out all set ups

and how they can be finally adjusted, from which thickness on the machine jigs should be employed as well as how the jigs should be set up and many other technical details.

This incomplete summary is just a guide-line as to how much knowledge is required from the personnel for one simple thicknesser machine to make it effectively useable.

For a seven-spindle moulder the summary of knowledge herein indicated is absolutely necessary and is even much longer. As it is not possible for all personnel to have government training the company itself must offer equivalent possibilities in optimal training programmes for their personnel. Into this category also fall apprenticeships, workshops and practical instruction, e.g. no company should be without an apprentice workroom for the factory electricians, in which all electrical connexions as used in the factory should be set up into functional test switchboards on which all functions can be checked and all switch plans and wiring systems can be studied which will prove essential for security later on in the factory.

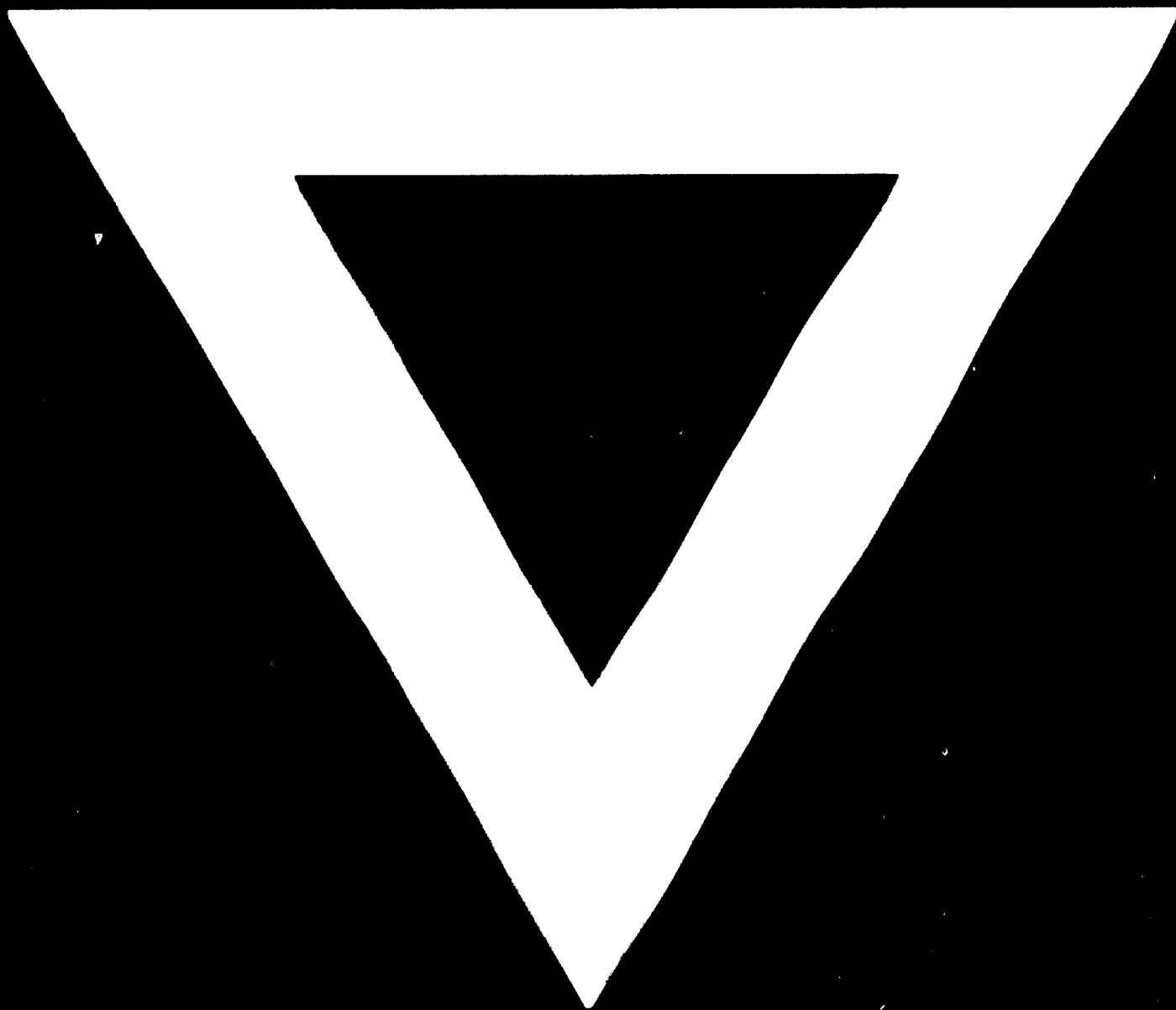
The same should also be applied to compressed air and all other installations and will prove to be vitally necessary in the instance of breakdowns occurring.

IX. Conclusions

A short talk cannot cover a complete checklist of the structure of a plant for semi-finished products. These suggestions and recommendations should at least help in the future in order to improve other peoples experience.



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