

3 Strategic approaches to resource husbandry and recovery: the superwash combo case study

3.1 Introduction

A group of production managers of the DOMAPP factory has to find solutions to problems that have occurred as a result of the necessity to increase the volume of production of the Superwash Combo product. A preliminary study of the company's structure, activities and problems was used as an initial database. The managerial team also included experts from various departments of the company and production department superintendents. The teams thus expanded ensure increased possibilities for outlining and identifying to a maximum extend the wide range of problems that need to be solved.

The main objective of the gathering that must be related to the overall system of objectives of the company is to prepare a plan to rescue the factory through increasing the production volume of the new washing machine, the Superwash Combo. It will be necessary to go through the following stages in order to be able to prepare this plan:

- Clarify the production situation in the DOMAPP factory. Prepare an analysis of: the process of conversion of raw materials into a built product; energy requirements; potential possibilities for re-use; customer perspectives, society, technical, economic and political factors [1].
- Prepare a suitable process flow chart for the main material chains in the product, from nature to consumers [2]. Considerations of re-cycling and possible re-use at both the components and complete product level should be given [1].

The techniques employed included the analytical synthesis method and the brain attack technique [1]. The following plan of action of the team has been prepared: All participants have been given sheets of paper where they were asked to write down their ideas about the problems placed. Participants were allowed to swap sheets to give them more hints and generate additional suggestions. Once this was complete all participants had to line up, discuss and assess the suggestions given.

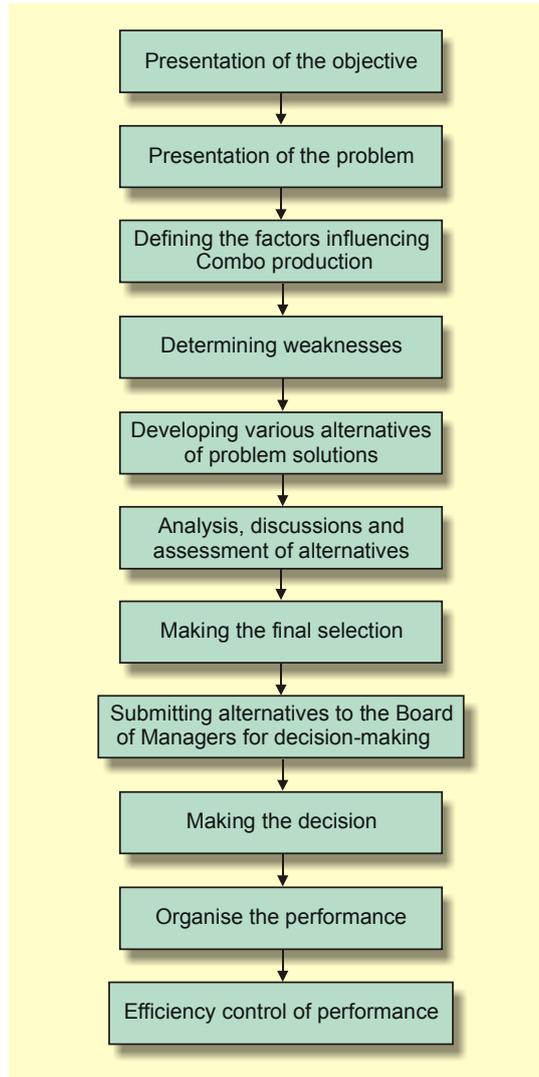


Figure 1 [2]

3.2 The team's work

The team advanced to the first objective: Identifying the factors that influence the Combo production. Results were arranged in a cause and consequence diagram, the Ishikava chart [3]. The cause and consequence diagram was build up observing the following sequence:

- the basic problem is presented as a main horizontal arrow in the diagram;
- all influencing factors were identified;
- major junctions of basic factors were marked (Figure 2);
- sub-factors were also marked by corresponding arrows for each basic factor;
- The arrangement of the diagram appears as a well-branched tree or fishbone (Figure 3).

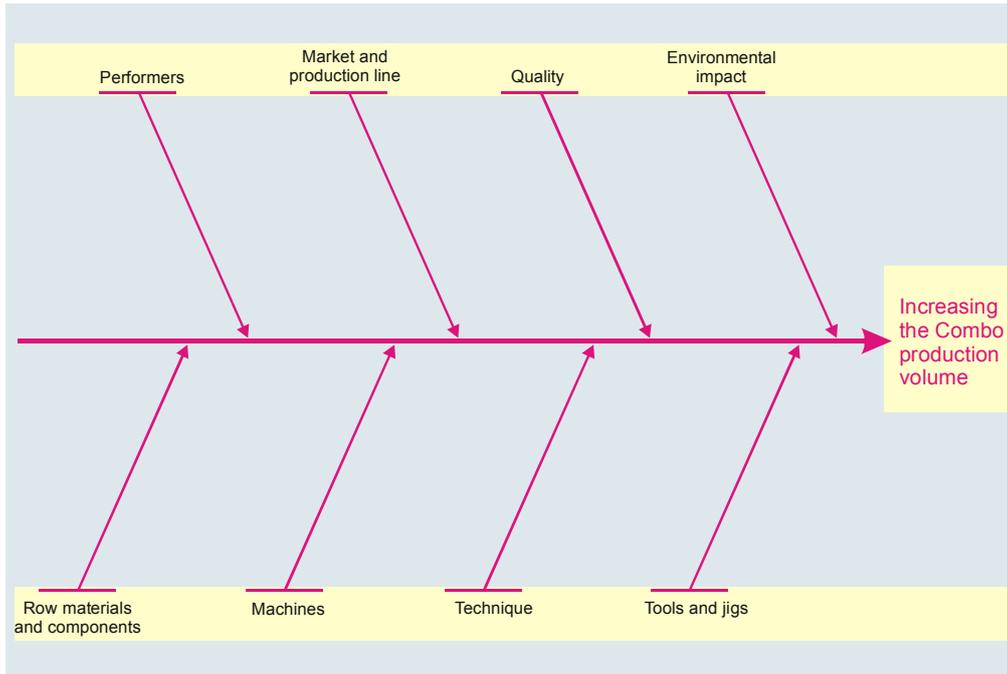


Figure 2

The diagram was then split up into separate branches and an assessment of performance of individual company activities was made to identify weaknesses. The brain attack technique was used to develop various problem solution alternatives [3].

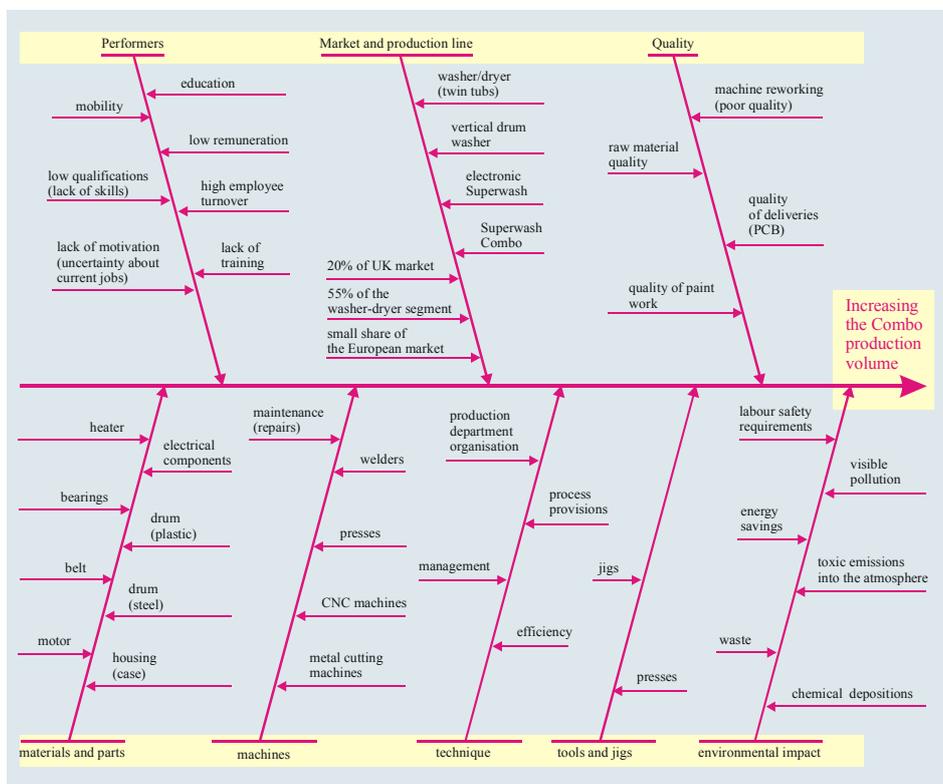


Figure 3

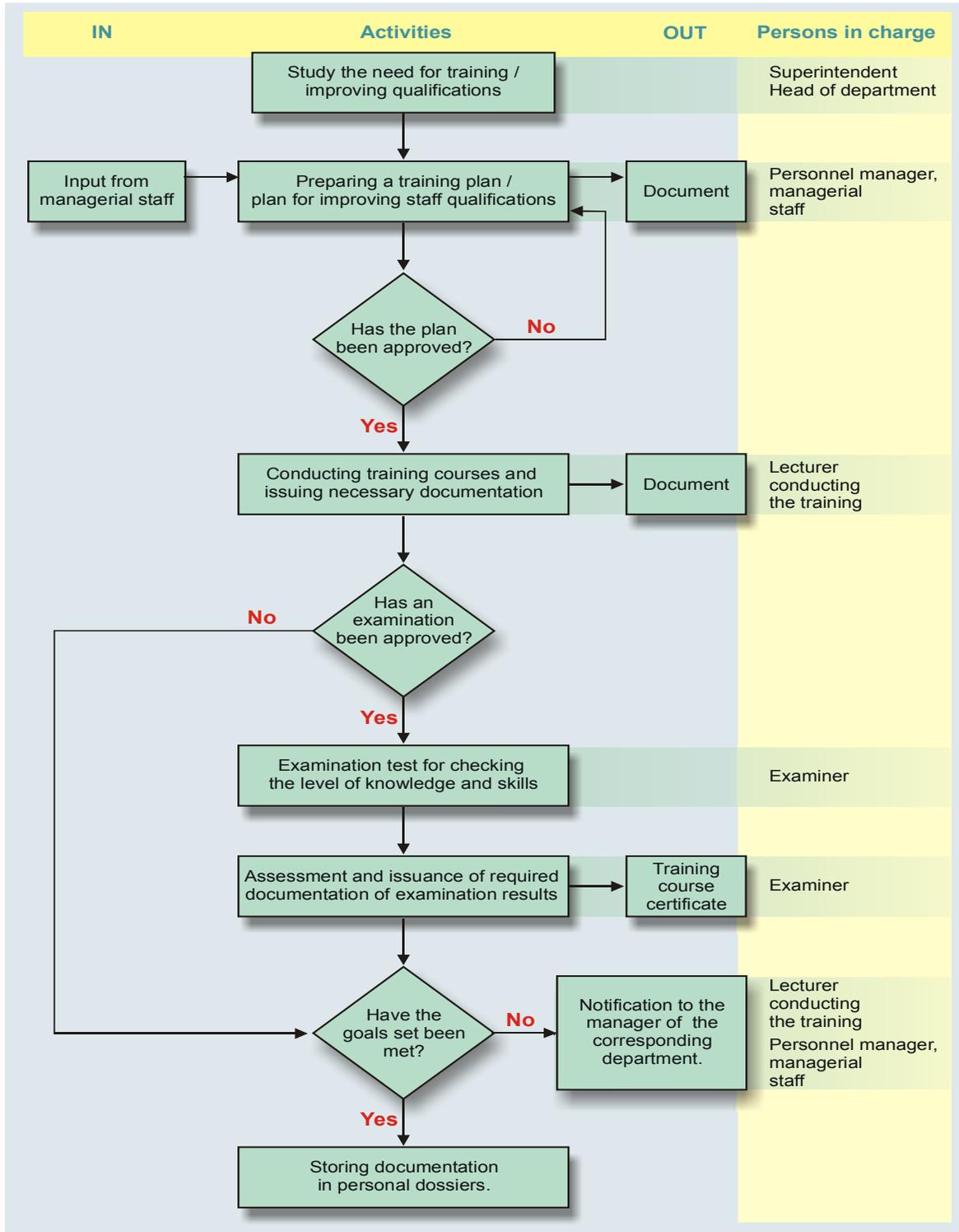


Figure 4

Each individual alternative that was suggested had its own particular cost that had to be paid. Therefore, the team had to approach a realistic plan that could be implemented involving the minimum amount of spending. As a result of many hours of hard work the following opinion was given on individual factors.

3.3 The performers

The lack of adequate training in the factory, low wages and lack of motivation in staff were identified as most significant weaknesses.

It was clearly stressed that the developed plan to increase the production capacity could not be implemented unless a well-motivated personnel is involved. Explanation activities will have to be undertaken to draw the workers attention to the fact that the increase in the Combo production will guarantee they retain their jobs and will rescue the factory and maintain the economic infrastructure in the region. Guarantees should be provided to the workers and all employees that the increase in production and company profit will also involve increase in wages and improved social service provisions. The larger market share of the new washing machine would raise the image of the company and all its employees [4].

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The working team has outlined the following programme to improve the quality of personnel [5]:

- reduce managerial staff and allocate new rights and responsibilities;
- conduct initial training of employees recruited to work for the company;
- conduct safety requirements training;
- prepare a plan of conducting training events on increasing staff qualifications (Figure 4);
- link the training given to eventual remuneration;
- preparing position profile documentation to identify the activities performed and rights and responsibilities allocated;
- training for fitters for rapid press tool change based on the process experience techniques gained from other companies in the field;
- high wages that would ensure high performance and high quality work.

3.4 Quality

The team has given high attention to the assessment of quality problems during component manufacturing and assembly of the Combo product. The main opinion was that elimination of re-working due to poor quality would substantially increase production efficiency. The company is 8% behind leading companies in the field.

Basic recommendations that were outlined were addressed to the need to increase the quality of PC boards supplied by the Electro company, the painting process and the defects observed in the washing machines.

Considering the fact that the Electro company is a division of AEE, the team has recommended the following possible solutions to quality problems of the delivered components [5]:

- signing a contractual agreement between the two factories ensuring the required quality of deliveries;
- introducing incoming deliveries control in the DOMAPP factory;
- requiring a quality certificate based on manufacturer performed inspections.

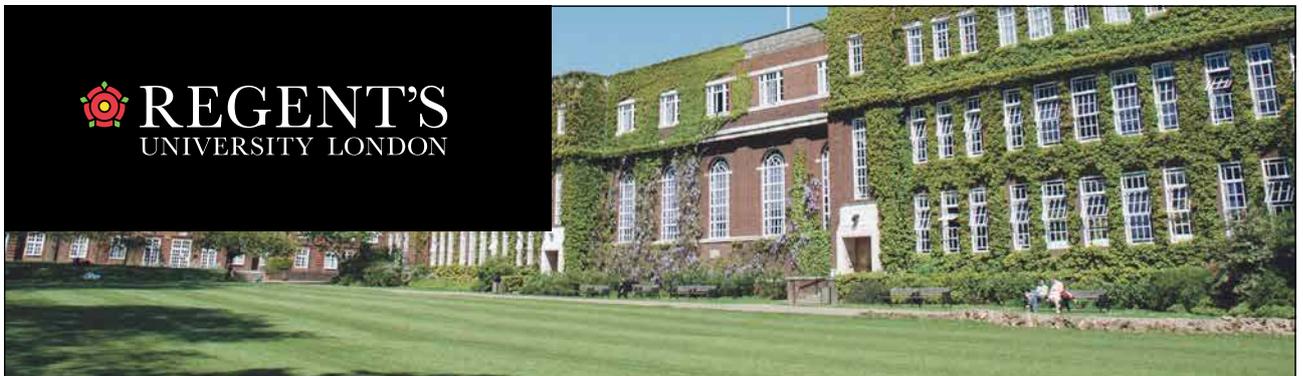
Specialists have identified the painting process as a special process where quality results could not be checked in a subsequent inspection and tests of the product. But even if this process involved old equipment it is still the final result of a number of operations and necessitates strict observance of these operations and their required sequence [3]. The team has outlined the following activities in order to help improve the painting quality [4]:

- Preparing operation performance instructions that set out the process parameters, process sequence, some special observations, adjustments and control;
- Employ or train adequately qualified personnel;
- Assess the suitability and applicability of equipment involved and quality of paint used.

To overcome the problem of occurring defects in finished washers and eliminate the need of reworking one of the production managers suggested to employ the Pareto's technique [6]. This method will help identify defects of higher significance to others, which are greater in number but far more insignificant, i.e. the highest value defects will thus be identified (in terms of cost and time) or those occurring most frequently [6]. Additional studies will have to be conducted afterwards to identify the causes for these defects and outline some corrective activities to eliminate these defects. The team agreed to include such a study in the overall action plan.

3.5 Market & production line

The working team has examined the characteristics of the washing machines manufactured in the company and came out with the conclusion that the latest Superwash Combo model is superior to all other models. This washer features modern design, saves energy thus contributing to environment protection, it has compact size and saves space. It is simultaneously low-cost product, which makes it highly competitive on the market. One proof of this is the high sales volume and the need to increase the production volume (Figure 5). All said above is an indication that customers prefer latest, modern and functional products available on the market, which facilitate servicing to a maximum extend and aesthetically please the eye with their appearance.



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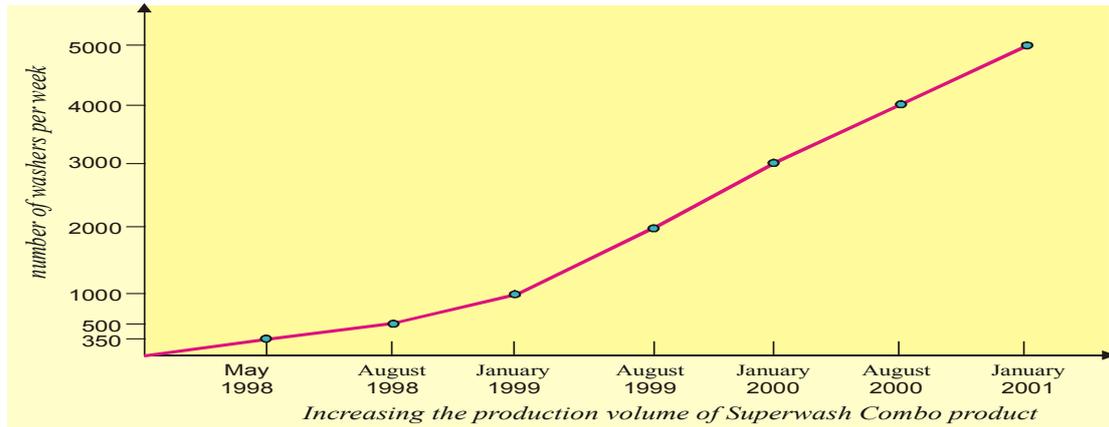


Figure 5

The final opinion was to adopt the suggestion of taking the double-tub model (an 18-year old design) out of production along with the vertical drum top-loading model. The proposal presented to the Board was backed up with a preliminary marketing analysis and identification of the life-cycle of the two older washers (Figures 6 and 7) The life cycle analysis has also involved the value of profit from the sales of these two products. When the market-required number of products from the production programme is less than the profitability threshold, provision is made for such washers to be taken out of the production programme [7].

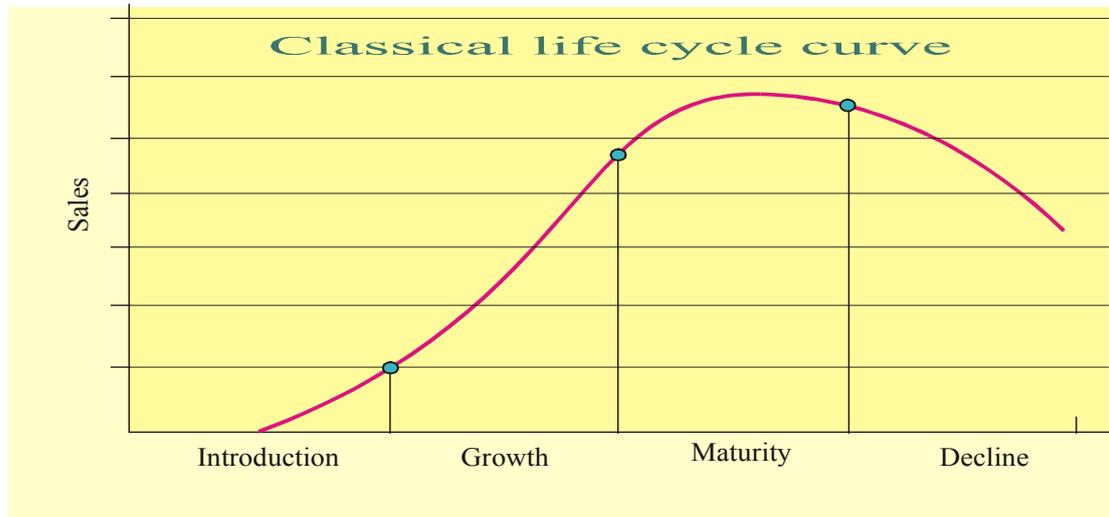


Figure 6

Introduction	Growth	Maturity	Decline
Sales volume			
Product introduction	Growth of sales	Market saturation	Decline of sales
Customers			
Small number	Increased number of customers and sales volume	Selective sales to selected customers	Sudden drop in the number of customers and volume of goods sold, decline and stop of production
Competitors			
Small number	Increased number of competitors	Severe competition. Prices go down	Competition eliminated. Prices drop to maintain sales volume

Figure 7: Characteristics of product life cycle stages

It is possible in this situation to use the freed production facilities to manufacture the Combo product and this concept has been visualised (compared to numbers of washing machines) in the following diagram:

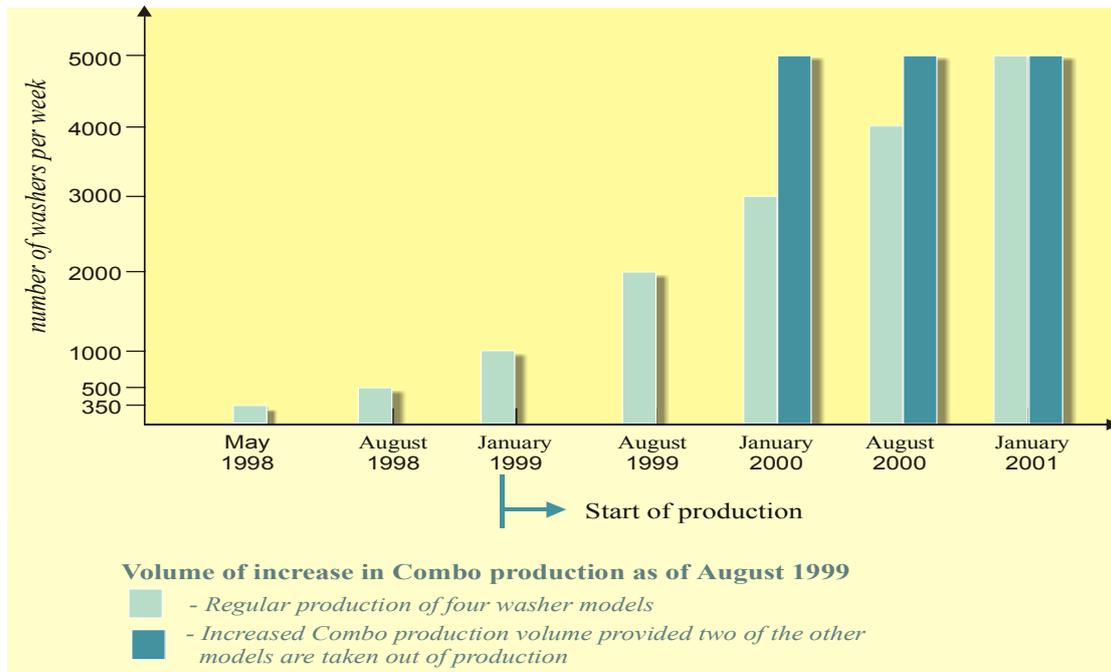


Figure 8

The chart shows that the Combo production capabilities will be rapidly increased. The increased production volume will allow for some reduction in expenditure involved leading to a reduction in cost as a means to increase the sales volume. The following considerations will have to be observed here [7]:

- Care should be given not to reduce prices too much lower than competitive ones in order to avoid unjustified reduction in the profit rate;
- Care should be taken not to make prices much higher than competitive products due to possible risks of wasting customers.

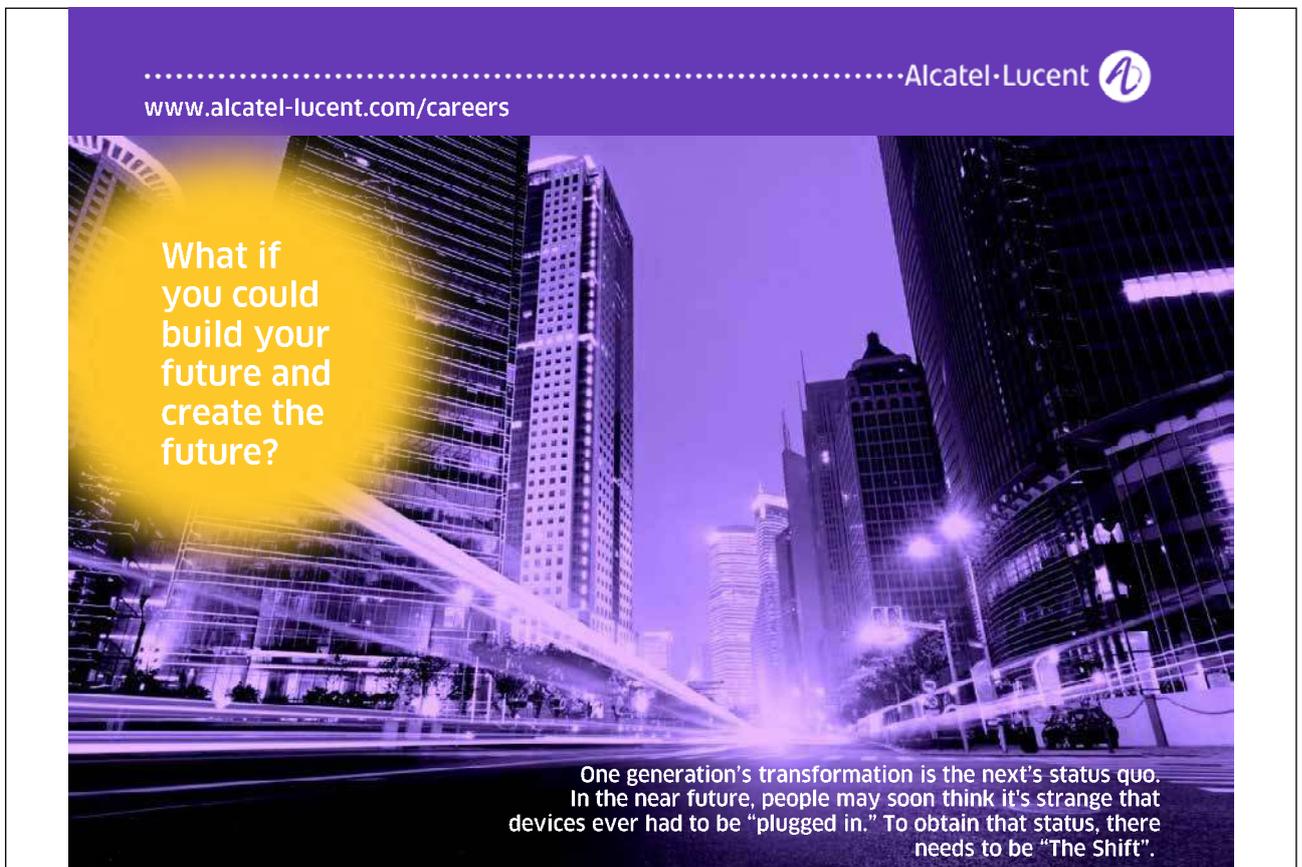
3.6 Environmental impact

In finding solutions to the set task of increasing the production volume the team could not skip the issue of environmental impact this would have. The following questions were raised:

- Will this lead to increased energy consumption?
- What waste will this generate and what will be the quantity of waste per unit product; will waste result in problems in handling it?
- What will be the influence on atmospheric emissions?
- Will the production process be safe and will there be safety problems?

Energy saving is a programme of reducing expenditure that leads to improvement of the environment through reductions in harmful sulphur oxides, sodium oxides, carbon oxides, hydrogen oxides and particulate residues [7].

Looking at the problem from this aspect, the team concluded that the Combo meets modern requirements for reduced energy consumption compared to similar products in the field [7]. The combined Combo unit also saves space compared to other models, which involves the use of far less materials of improved functional capabilities.



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The quality improvement programme for component parts and complete products will affect the reliability and life expectations of the Combo product. It will also reduce repair and maintenance, spare part replacement and some additional activities that will have impact on environment [8]. Faultless operation and many years of exploitation will allow the Combo product to be subjected to recycling and re-use of materials at the end of its life cycle.

The team examined the idea of developing a programme that will reduce waste products with a special accent on the fact that this programme will help increase the efficiency of production resource usage, the overall activity efficiency. The aim is to make maximum use of all components and other resources and materials that will result in the generation of products and not waste.

In order to persuade the senior management in the need to adopt and implement such a programme the following obvious advantages of reducing waste were stressed [8]:

- Protection of the environment;
- Direct reduction in expenditure;
- Indirect reduction in expenditure;
- Jobs safety;
- High social esteem;
- Support of the share holders;
- Technological advantages.

3.7 Machines

The manufacturing process at the DOMAPP factory involves the production of their own component parts, delivery of sub-supplier assemblies and assembling the complete product. The projected increase in production volume will put additional load on the machines and equipment available and give rise to possible machine failures. The need for providing adequate maintenance and repair of the machines is primarily determined by the deteriorated technical and economical characteristics of the machines and equipment resulting from their physical and moral wear. Some disastrous consequences in the following spheres might be possible if a programme for maintaining and ensuring the life of machines and equipment is not adopted [6]:

- Life and health of servicing personnel;
- environment;
- quantity and quality of manufactured washing machines;
- economic results.
- It will be necessary to prepare an overhaul plan that is based on the following factors:
 - initial technical condition of machines and equipment;
 - wearing factors;

- service time;
- intensity of usage;
- usage conditions and surroundings;
- method of usage (in accordance with technical provisions or allowing severe mistakes).

Preparing such an overhaul plan will allow identifying the expense it will involve quite in advance, along with the time required to do it and the purchasing of necessary spare parts needed.

A problem area for possible failures was identified in the welding facility. An eventual failure in welders would disturb the production process. Therefore, a preventive strategy in performing overhaul activities is to be recommended for the machines in this production area. This strategy involves the following activities [8]:

- inspection and measuring the degree of wear on welders;
- thorough maintenance of welders realised by means of constant care expressed in: cleaning, lubricating, corrosion protection, tightening loose connections, minor repair activities aimed at maintaining the set technical fitness;
- identifying fast wearing parts and purchasing a required stock of them to ensure for possible failures;
- modernisation or replacement of physically or morally worn out technical equipment.

The involvement of a CNC machine was identified as one weakness in the operation of the available machine inventory. The problems appear in two directions: constant machine breakdowns and programming difficulties. CNC machines feature a rather complex design that employs high-level electronic equipment. When a maintenance team has had no experience with such machinery it cannot always deal with breakdowns [7]. A special maintenance team will be necessary to be set up that should include one mechanical engineer, a fitter and an electronic specialist. This team should be trained on the site by an expert of the machine manufacturer or in the facilities of the machine manufacturer.

In order to solve the second problem with the CNC machine it will be necessary to employ in company or train an operator-programmer to operate this machine. Another solution is to subcontract a computer company for the programming activities and the factory will then only have to ensure the required process documentation specifying the component machining process sequence. Proper operation of the CNC machining centre will allow it to manifest its production efficiency capabilities. Production reports will change the negative attitude among factory employees and will pave the way to introducing new technologies and implementation of high-efficiency machines and equipment. Lack of such machines predetermines low production volume and high labour expenses (18% of sales volume) [6].

3.8 Process technology & management

A factor that might influence the eventual increase in the Combo production volume is the drawing up of a process technology profile. This includes [8]:

- developing the documentation for various manufacturing processes;
- developing documentation for the specialized process machinery and equipment;
- developing the documentation for the required means of mechanisation and process automation;
- developing the specialised process machinery and equipment.

At present the factory has developed manufacturing techniques for the production of small batches of the Combo product. An increase in Combo production volume will necessitate modifications to these techniques to ensure maximum loading of manufacturing facilities. This process will have to follow the following sequence [9]:

- analysis of manufacturing facilities load;
- analysis of the production programme;
- analysis of the design compatibility of the products, assemblies and components being produced;
- grouping those of them that are compatible in design characteristics;
- analysis of the process technologies applied;

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- developing single manufacturing technologies applicable to the entire group of compatible products, assemblies and component parts;
- analysis of organisational forms of production;
- developing highly efficient process equipment and machinery;
- improving the organisational form of production of component parts, assemblies and products.

The increase in the Combo production volume will call for adaptation of currently available production facilities (efficient capacity) to the required facilities by means of [9]:

- planned additional subcontracting externally manufactured orders;
- additionally employed labour;
- purchasing modern technological equipment;
- technological and organisational improvement.

Production planning and distribution is also an important element in increasing production efficiency that involves:

- planning the annual production programme that includes all washing machine models produced;
- distribution of the annual production programme;
- planning the required quantities of parts and assemblies;
- developing process route plan;
- calendar planning (developing network diagrams);
- preparing production orders;
- planning job positions loading;
- providing the equipment and documentation required for each job position.

The selection and maintaining of a rational form of production department organisation is one of the tasks of the managerial staff at the DOMAPP factory. For example, the welding facility in the factory needs special tooling and jigs that have to be taken out of the tool and jig store. This whole process requires about an hour to do. It is necessary to consider some optimisation of the production department distribution to allow easy access to tools and jigs. Figure 9 shows one suggestion for such a distribution [9].

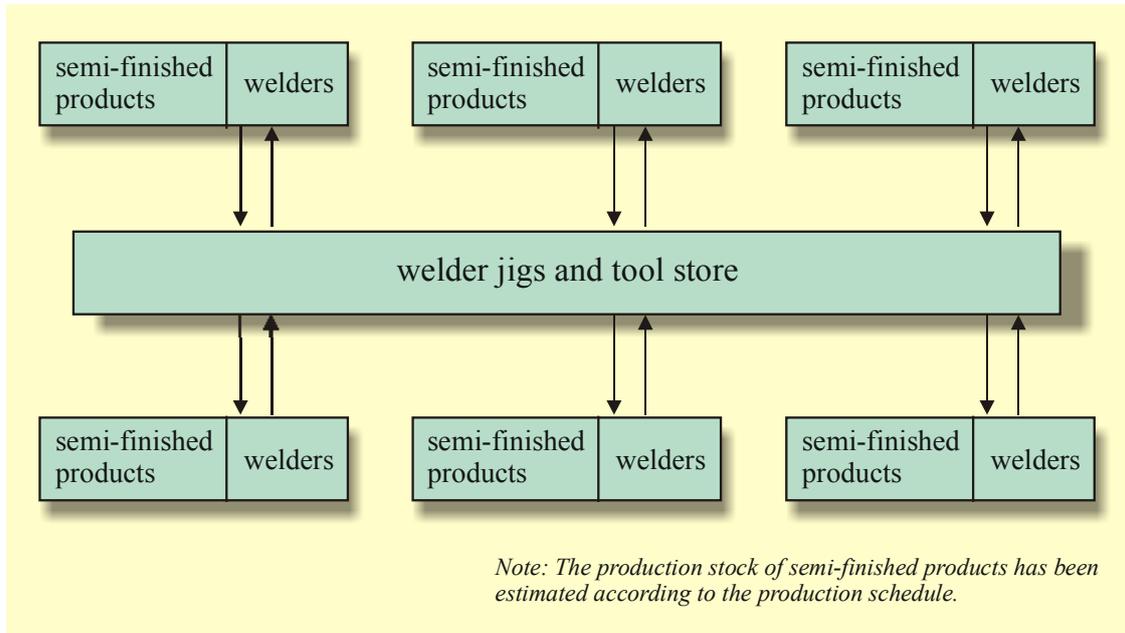


Figure 9

3.9 Raw materials & component parts

Then washing machines being manufactured in the factory consist of standard unified bought-in assemblies and some original component parts manufactured on the spot in the factory. Some of the assemblies are delivered by other factories of the division, like for example the PC boards manufactured by the Electro factory. One necessary requirement for the fulfilment of the production programme is timely delivery and production of these products, assemblies and component parts. One major priority for the factory is to ensure the delivery of those materials without which the production process will not start. Such problem exists in the delivery of the PC boards. The factory at Bournemouth does not supply enough boards and does not take Swansea's needs too seriously. A solution to this problem could be found by asking the corporate management for cooperation by means of signing supply agreement between the two factories [10]. Such an agreement will provide the legal commitment of the Electro factory.

Another alternative exists to replace the metal drum of the Combo for a plastic one. This change will make the entire construction lighter and improve the material recycling possibilities but will on the other hand reduce the work load in the pressing and welding facilities which might in turn result in personnel cut downs and social tension. The working team has come out with a suggestion to the design department and the marketing department of the factory to assess the possibilities to produce an alternative plastic drum Combo to be offered on the market separately [10]. Thus, various customer requirements will be met and the market situation will be used to establish the current Combo model.

3.10 Conclusions

Having completed the problem analysis work the working team has systemised its suggestions in solving these problems in a general report to the Board of directors of the company. This summarises in the order of priority the major problems that have to be solved very quickly and which will result in an increase in Combo production volume:

1. Stop the production of the two older washing machine models.
2. Follow the programme for dealing with employees.
3. Follow the programme for improving the quality.
4. Improving production efficiency by improving manufacturing process techniques and the organisational and managerial structure.

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