MACHINE SHOP

PRODUCTION PLANNING

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(Hemant Daulat Nagare)

Place: Mumbai

Date: 12th December, 2007

APPENDIX - I

CERTIFICATE FROM THE GUIDE

This is to certify that the Project Work titled **MACHINESHOP PRODUCTION PLANNING** is a bonafide work carried out by our employee **Mr. Hemant Daulat Nagare** working as a Senior Engineer - Production & QA, a candidate for the final year Post Graduate Diploma in Business Administration **(PGDBA - Operations)** examination of WELINGKAR INSTITUTE OF MANAGEMENT, MUMBAI, **Roll No.: DPGD/JA06/362**, under our guidance and direction.

Guides :

Mr. A. M. Deshpande.	**Mr. R. D. Joshi**
Works Manager	**General Manager**

Date : 12.12.2007

Place : Thane

PREFACE

I take an opportunity to present this project report on **"MACHINE SHOP PRODUCTION PLANNING"** and put before the readers some useful information regarding my project.

I have made sincere attempts and taken every care to present this matter in precise and compact form, the language being as simple as possible.

I am sure that the information contained in this volume would certainly prove useful for better insight in the scope and dimension of this project in its true perspective.

The task of completion of project though being difficult was made quite simple, interesting, and successful due to deep involvement and complete dedication of my colleagues.

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INTRODUCTION TO COMPANY:

Avdel (India) Private Limited is a part of well-established group of companies, founded in 1961. Avdel (India) started manufacturing special blind rivets in technical collaboration with Avdel Systems Limited, U.K. (now a part of Acument Global Technologies). Today with our Head Office in Mumbai, we provide a wide range of fastening systems and other hardware to the aircraft, automotive, switchgear, white goods, telecommunications, building and construction, electronics and several other industries. Avdel has sales offices and representatives in Bangalore, New Delhi, Kolkata (Calcutta), Chennai (Madras) and Pune.

Avdel (India) is an ISO 9001 certified company with an excellent marketing and service network. In addition to our own two manufacturing plants in Maharashtra (on the west coast of India), Avdel also acts as distributors and marketing and selling agents for several well-known International fastener manufacturing companies, including Acument Global Technologies, Monogram Aerospace fasteners, Click bond, Longlok, Dust bubble, and many more. Our product range includes:

- Blind fasteners
- Helicoil thread inserts
- Self clinching fasteners
- Roofing screws
- Installation tools
- Solid rivets
- Other Threaded fasteners

An excellent infrastructure facility, strong regional presence, and a commendable service back up ensures a high degree of customer satisfaction and excellent after sales service to the end user.

Continuous improvement and Quality Assurance is the objective of the company and key to success. In order to consolidate our position, we have divided the activities of the company into the "Aerospace" and "Commercial" divisions.

AEROSPACE DIVISION:

Avdel's Aerospace division caters to the fast growing Aeronautical & Aerospace industry in India and other countries in South east Asia. Although our experience with the aerospace industry stemmed from the fastener trade, today we supply the aerospace

industry with not only fasteners but various other components as well. These include raw materials, engine parts, avionics, control cables, electrical parts and a whole array of other products, allowing us to supply a large variety of products to various Aerospace customers, spread all over the region.

Today, with our technical capabilities and long association with the Aerospace market along with our team of well qualified sales engineers and vibrant sales administrative team, we boast of having one of the strongest marketing / distribution outfits in the Aerospace industry today.

Avdel Aerospace division's long term plan is focused on serving the Aviation industry in a much bigger way than they currently do by offering new products and providing a high degree of commercial and technical support throughout the Middle East & South East Asia region for supplies of their various products.

Aerospace Division Products:

- Fasteners
  - Temporary fastener
  - Blind Rivet
  - All composite threaded fastener
  - Shear Pin
  - Latching system
  - Fastener for soft core
  - Adhesive Bonded Fasteners
  - Solid Rivet
  - Blind Bolt
  - Inserts
  - Fastener
  - Adjustable Dimension Fastener
  - Semi Tabular Rivet
  - Nuts
  - Helicoil Thread Inserts
  - Potted Inserts
  - 1/4 turn fastener
  - Clip on fastener

- One Piece Fastener
- Raw Materials
  - Honey Comb sheets
- Hardware
  - Hardware
  - Hoses
  - Ground handling pin with Positive Locking
  - Sleeves
  - standoff spacer

COMMERCIAL DIVISION:

Avdel's Commercial division delivers reliable fastening systems of all types. we have a wide customer base serving small as well as large multi-national companies across India. We have excellent infrastructure facilities, strong regional presence, and commendable service back up & quality backed by ISO 9001 certification. By leveraging on these strengths we provide solutions that improve Quality & Speed of assembly for our customers products & processes, thereby increasing cost effectiveness & efficiency.

In addition to manufacturing our own range of special blind fasteners at two plants, we also act as distributors offering varied range of fasteners & relevant tools, from worldwide suppliers. Our fasteners find application in agriculture equipment, automotive assemblies & components, building and construction, control panels, cabinets & enclosures, commercial vehicle bodies, domestic appliances, freight containers, heating & ventilation, railway rolling stock, roofing & cladding, switchgears, telecommunication equipments, window frames & many more.

Commercial Division Products :

- Fasteners
  - Blind Fasteners
    - Breakstem Fasteners
    - Structural Fasteners
    - Speed Fasteners
    - Blind Nut Inserts
  - Bonded Fasteners
    - Adhesive Bonded Fasteners
  - Threaded Fasteners
    - Camcar parts list
    - Roofing Screws
    - Helicoil
  - Special Fasteners
    - Insert for plastics
    - Sheet Metal Fasteners(Clinching & Riveting)
    - Direct Screw Fixing
    - Spring Steel Special Components
- Installation Tools

AVDEL'S PRODUCT FEATURES : AVEX MULTIGRIP BLIND RIVETS

The fastener:

Avex is a unique, one-piece fastener that requires access from one side only. It is available in aluminum alloy material in a variety of lengths and diameters. To meet the varied demand in the manufacturing industry, Avex is also available in varied head forms such as raised head, countersunk and large flange (for softer materials).

Multigrip capability:

Its significant, cost effective feature enables each rivet size join a wide range of material thickness. Other conventional rivets of different lengths would be required to achieve the same result.

Hole fill:

Avex ensures complete hole fill even in oversize, irregular, or misaligned holes. The result is high clamp up, high shear strength, and positive stem retention. The retained stem plugs the tail end of the rivet bore giving a vibration and weatherproof seal.

Subsequent benefits are:

- Substantial reduction in stock.
- Simplified re-order procedure
- Reduced operator errors and improved efficiency

Features and benefits:

- Multigrip capability - Improved operator efficiency
- Complete hole fill - High strength, Vibration resistant assembly
- Variety of head forms - Extended scope for materials and application
- One-sided application - Increased speed of assembly and reduced costs.
- Wide choice of installation equipments - Provides flexibility and scope on production lines.
- High-speed installation - High output and lower assembly costs

SELECTION CRITERIA:

The factors detailed below are designed to help you select a fastener suitable for your application:

Grip range:

The fastener should be selected to ensure that the thickness of the parent material(s) falls within a grip range. Most Avdel breakstem fasteners offer multi-grip capability with Steel Avex, Avex fasteners offering exceptional multi-grip performance.

Hole Size:

This is specified on the relevant technical data sheet for the fastener. It is important to control the hole size accurately in order to ensure optimum fastener performance.

Special Surface Coatings:

For improved corrosion resistance we can apply many protective coatings, including: deltaseal, extra zinc plating, zinc-nickel plating and anodized finishes for aluminum alloy fasteners, with or without dyeing. Where it is important to improve corrosion resistance and match the surrounding colour, clear, black, yellow, and other passivations are available.

Strength Characteristics:

Breakstem fasteners offer high shear and tensile strength. Please refer to the technical data sheets for typical strength values.

Load Spreading:

Most Avdel breakstem fasteners have a large blind side area. Avisoft fasteners provide exceptional load spreading capability and are ideal for use in thin sheet or low strength materials.

PRODUCTION PLANNING AND CONTROL

INTRODUCTION:

Principle of Production Planning and Control:

"The highest efficiency in production is obtained by manufacturing the required quantity of a product, of the required quality, at the required time by the best and cheapest method" – PPC is a tool to coordinate all manufacturing activities in a production system.

Production planning and control essentially consists of planning production in a manufacturing organization before actual production activities start and exercising control activities to ensure that the planned production is realized in terms of quantity, quality, delivery schedule and cost of production.

Production planning involves the organization of an overall manufacturing / operating system to produce a product.

The various activities involved in production planning are designing the product, determining the equipment and capacity requirement, designing the layout of physical facilities and material and material handling system, determining the sequence of operations and the nature of the operations to be performed along with time requirements and specifying certain production quantity and quality levels.

Objective of production planning is to provide a physical system together with a set of operating guidelines for efficient conversion of raw materials, human skills and other inputs into finished products.

Factors determining Production Planning Procedures:

The production planning used, varies from company to company. Production planning may begin with a product idea and a plan for the design of the product and the entire production/operating system to manufacture the product. It also includes the task of planning for the manufacturing of a modified version of an existing product using the existing facilities. The wide difference between planning procedures in one company and another is primarily due the differences in the economic and technological condition under which the firms operate. The three major factors determining production-planning procedures are:

Volume of Production:

The amount and intensity of production planning is determined by, the volume and character of the operation and the nature of the manufacturing processes. Production planning is expected to reduce manufacturing costs. The planning of production in case of custom order job shop is limited to planning for purchase of raw materials and components and determination of works centers, which have the capacity of manufacturing the product.

Nature of Production Processes:

In job shop, the production planning may be informal and the development of work methods is left to the individual workman who is highly skilled. In high volume production, many product engineers are involved and they put enormous amount of effort in designing the product and the manufacturing processes.

Nature of Operation:

Detailed production planning is required for repetitive operation. For example in case of continues production of a single standardized product.

The variants in manufacturing approach are:

- Manufacturing to order, which may or may not be repeated at regular intervals.
- Manufacturing for stock and sell (under repetitive batch or mass production). Example: Manufacture of automobiles, watches, typewriters etc.

Objectives of Production Planning and Control

1. To deliver quality goods in required quantities to the customer in the required delivery schedule to achieve maximum customer satisfaction and minimum possible cost.
2. To ensure maximum utilization of all resources
3. To ensure production of quality products
4. To minimize the product through-put time or production/ manufacturing cycle time
5. To maintain optimum inventory levels.
6. To maintain flexibility in manufacturing operation.
7. To co-ordinate between labour and machines and various supporting departments
8. To plan for plant capacities for future requirements
9. To remove bottle neck at all stages of production and to solve problems related to production

10. To ensure effective cost reduction and cost control

Three stages in Production Planning and Control function are:

1. **Planning** – Choosing the best course of action among several alternatives.
2. **Operation** – Execution as per plan
3. **Control** - Maintaining the performance by comparing the actual results with performance standards set and taking appropriate correction action if necessary to reduce variance.

Role of Machine shop Production Planning and Control :

There are varieties of production management responsibilities viz:

1. Product design.
2. Job design and process design.
3. Equipment selection and replacement.
4. Labour skills and training programs.
5. Input material selection including raw material and sub-contracting.
6. Plant selection and layout.
7. Scheduling steps of the plan.
8. Implementing and controlling the schedule.
9. Operating the production system.

Machine shop production planning is done over a short-range time span developed by the junior level management. It is concerned with the utilization of existing facilities rather than creation of new facilities. It involves proper utilization of key resources such as, raw materials, machine capacity, energy etc.

Short-term planning takes into account current customer orders, priorities, material availability, absenteeism rate, cash flows etc. and it is designed to respond quickly to changes in production levels and market conditions.

Short range planning establishes short range schedules which specify the quantity of specific products to be produced in each week of the planning horizon which varies from a week to a few months.

Machine shop planning involve the day to day issues and decisions related to operations planning.

SCOPE OF MACHINE SHOP PRODUCTION PLANNING :

Production Planning and Control encompasses following areas:

1. **Materials:** Planning for procurement of raw materials, components, and spare parts in the right quantities and specifications at the right time from the right source at the right price. Purchasing, storage, inventory control, standardization, variety reduction, value analysis, and inspection are the other activities associated with material.
2. **Methods:** Choosing the best method of processing form several alternatives. It also including determining the best sequence of operations (process plans) and planning for tooling, jigs and fixtures etc.
3. **Machines and equipments :** Manufacturing methods are related to production facilities available in the production systems. It involves facilities planning, capacity planning, allocation, and utilization of plant and equipments, machines etc.
4. **Manpower :** Planning for manpower (labour and managerial levels) having appropriate skills and expertise.
5. **Routing :** Determining the flow of work material handling in the plant, and sequence of operations or processing steps. This is related to consideration of appropriate shop layout and plant layout, temporary storage locations for raw materials, components and semi-finished goods, and of materials handling systems.

   Route sheet : A route sheet is a document providing information and instruction for converting the raw materials into finished parts or products. It defines each step of the production operation and lays down the precise path or route through which the product will flow during the conversion process. Route sheet contains the following information:

   - The operations required and their desired sequence.
   - Machine or equipment to be used for each operation.
   - Estimated set-up time and operation time per piece.
   - Tools, jigs and fixtures required for the operation.
   - Detailed drawing of parts, sub-assemblies and final assemblies.
   - Specification, dimensions, tolerances, surface finishes and quality standards to be achieved.
   - Specification of raw material to be used.

- Speed, feed etc. to be used on machine tools for the operations to be carried on.
- Inspection procedure and metrology tools required for inspection.
- Packing and handling instructions during movement of parts and subassemblies through the operation stages

6. **Estimating :** Establishing operation times leading to fixation of performance standards both for workers and machines. Estimating involves deciding the quantity of products to be produces and cost involved in it on the basis of sales forecast.

   Estimating manpower, machine capacity and materials required meeting the planned production targets are the key activities before budgeting for resources.

7. **Loading :** Machine loading is the process of converting operation schedules into practice in conjunction with routing. Machine loading is the process of assigning specific jobs to machines, men, or work centers based on relative priorities and capacity utilization. Loading ensures maximum possible utilization of productive facilities and avoids bottlenecks in production. It is important to avoid either overloading or under loading the facilities, work centers or machines to ensure maximum utilization of resources.
8. **Scheduling**: Scheduling ensures that parts, sub-assemblies, and finished products are completed as per required delivery dates. It provides a timetable of manufacturing activities.

Objectives of scheduling are :

- To prevent unbalance use of time among work centers and departments.
- To utilize labour such that the output is produced within established lead time or cycle time so as to deliver the products in time and complete production at minimum total cost.

9. **Dispatching :** This is concerned with the execution of the planning functions. It gives necessary authority to start a particular work which has already been planned under routing and scheduling functions. Dispatching is release of orders and instructions for the starting of production in accordance with the route sheets and schedule charts.
10. **Inspection :** This function is related to maintenance of quality in production and of evaluating the efficiency of the processes, methods and labour so that

improvements can be made to achieve the quality standards set by product design.

11. **Evaluating :** The objective of evaluation is to improve performance. Performance of machines, processes and labour is evaluated to improve the same.
12. **Cost control :** Manufacturing cost is controlled by wastage reduction, value analysis, inventory control and efficient utilization of all resources.

PRODUCTION CONTROLS:

Importance of Control Function:

The function of production control is to :

- Provide for the production of parts, assemblies and products of required quality and quantity at the required time.
- Co-ordinate, monitor & feed back to manufacturing management, the results of the production activities, analyzing and interpreting their significance and taking correction action if necessary.
- Provide for optimum utilization of all resources.
- Achieve the broad objectives of low cost production and reliable customer service.

Benefits of Production Control:

1. **Improvement in profits through:**
   - Maintenance of a balanced inventory of material, parts. (WIP) Work in process and finished goods.
   - Balanced and stabilized production.
   - Maximum utilization of equipment, tooling, labour (manpower) and manufacturing and storage space.
   - Minimum investment in inventory.
   - Reduction in direct costs.
   - Reduction set up costs
   - Reduction scrap and rework costs
   - Reduction in inventory costs

2. **Competitive advantages:**
   - Reliable delivery to customers
   - Shortened delivery schedules to customers

- Lower production costs and greater pricing flexibility.
- Orderly planning marketing of new or improved products.

Elements of Production Controls:

- Control of planning: Assure receipt of latest forecast data from sales and production, bill of materials data from product engineering and routing information from process engineering.
- Controls of materials: Controls of inventory and providing foe issue of material to the shop and movement of materials within the shop.
- Control of tooling: Check on the availability of tooling and provide foe issue of tools to departments from tool cribs.
- Control of manufacturing capacity: Determine the availability of equipment and labour capacities and issue realistic production schedules and provide a means of recording completed production.
- Control of activities: Release order and information at assigned times.
- Controls of information: Distribute timely information and report showing deviations from plan so that correction action can be taken and provide data on production performance measurement for future planning.

Production Control System:

The production Control system consists of a group of procedural elements that operates as a whole to fulfill the four functions listed under importance of control functions.

The elements of production control systems are:

- Means of setting the system in motion such as production orders.
- Methods to determine lead-time for production.
- Methods to control and monitor production operations including means to:
- Determine what and where work to be done
- Determine when work is to be done
- Issue orders to production shops and ensure that work is completed.

- Techniques for measuring and recording data machine utilization, scrap and indirect labour that can serve as a basis for manufacturing action leading to optimum utilization of facilities and low cost operation.
- An information system for display, recording and retrieval as well as processing and flow of data.

Factors Determining Production control Procedures:

- Nature of Production: The manufacturing firms are classified as intermittent, continuous or composite production firms, depending on the length of processing time without set up changes.
- Complexity of Operations: Generally the complexity of production planning and control function increases with the increase in the variety of operations.
- Magnitude of operations: The size of operation (i.e. the time taken to complete the operation) and the distance traveled by the parts from operation to operation are important in establishing proper production control procedures.

Production Planning and Control

Production Planning and Control function essentially consists of planning production in a manufacturing organization before actual production activities start and exercising control activities to ensure that the planned production is realized in terms of quantity, quality, delivery schedule and cost of production.

Phases in Machine shop PPC functions :

1. Planning phase – a) Pre-planning; b) Active Planning.

- **Pre-planning** activity involves product planning and development, demand forecasting, resource planning, facilities planning, plan planning, plant location and plant layout.
- **Active planning** involves planning for quality, determination of product-mix, routing, scheduling, material planning, process planning, facility planning, capacity planning and tool planning.

2. Action phase : Execution or implementation phase includes dispatching and progressing function.

3. Control phase : Includes status reporting, material control, tool control, inventory control, quality control, labour output control and cost control.

Benefits of Machine shop production planning and control function:

Production planning and control function is the nerve centre or heart of the production management function. It coordinates all phases of the production system. An efficient production planning and control function results in higher quality, better utilization of resources, reduced inventories, reduced manufacturing cycle time, faster delivery, better customer service, lower production costs and lower capital investment and higher customer satisfaction. Efficient utilization of resources results in higher productivity and economy of production, timely delivery and right quality of goods/services at the right cost will improve customer satisfaction. Minimization of breakdown of machines, plant and equipments minimize idle time of equipments and labour and ensures even flow of work through the plant facilities. This will improve employee discipline and morale in the organization.

An efficient production planning and control system enables the firm to improve its sales turnover, market share and profitability and provides a competitive advantage for the firm due to balanced inventory levels and higher quality, flexibility and dependability and lower prices which are the performance factor for the firm.

Limitation of Machine shop production planning and control function

- Production planning and control function is based on certain assumptions or forecasts of customer's demand, plant capacity, availability of materials, power etc. If this assumption go wrong, PPC becomes ineffective.
- Employee may resist changes is production levels set as per production plans if such plans are rigid.
- The production planning process is time consuming when it is necessary to carry out routing and scheduling functions for and complex products consisting of a large no of parts going into the product.
- Production planning and control function becomes extremely difficult when the environmental factors change very rapidly such as technology, Customer's taste regarding fashion or style of products needed, government policy and controls change frequently, stoppage of power supply by electricity boards due power cuts, break in supply chain due to natural calamities such as floods, earthquakes, war etc.

Measuring Effectiveness of PPC function :

The task of PPC department is mainly to coordinate the activities of various departments, which supports production department viz., purchase, stores, industrial

engineering, quality control, design, maintenance etc. Hence the effectiveness of PPC Department can be generally measured by the company's success in meeting the demand and its ability to produce quality products and deliver them in the delivery schedules desired by the customers at a reasonable price that is acceptable to customers and thereby achieve maximum customer satisfaction.

There are four specific areas in which effectiveness of PPC function can be measured. They are

- **Delivery** : This can be measured by finding out the number of deliveries effected on time and those got delayed over a period of time
- **Inventory levels** : The value of average inventory held annually value of obsolete inventory, value of non-moving and surplus inventories and the inventories and the inventory turnover ratio are indicators of efficiency in inventory management.
- **Production / operation management** : Comparison of planned and actual production indicates the performance of PPC function. Number of overtime hours worked, machine utilization ratio etc is also indicator of effectiveness of PPC function.
- The expenditures incurred for carrying out the various function of PPC dept. vis-à-vis the production values and sales revenue realized.

PPC in Different Production systems

1) P.P.C. in Job Production

Job production involves manufacture of products to meet specific customer requirements of special orders. The quantity is usually small. Examples of job production are manufacture of large turbo generators, boilers, steam engines, processing equipments, material handling equipments, ship building etc.

Under job production we may have three types according to regularity of manufacture namely,

a) A small number of products produced only once.
b) A small number of products intermittently when the needed arises.
c) A small no of products produced periodically at known interval of time.

PPC function is relatively in job production because of the following reasons

- Every job order is of different nature and has different sequence of operations. There is no standardization routing for job orders.
- Specific job orders are assigned to different workstations as per availability of capacity.

- Production schedules drawn depend on the relative priority assigned to several of job orders.
- Scheduling is dependent on assessment of production times and estimating is based on judgment.

2) P.P.C. in Batch Production

Batch production is the manufacture of a number of identical articles either to meet a specific order or to satisfy continuous demand. The decision regarding tooling and jigs and fixtures are dependant on the quantities involved in the production batch.

In batch production too there can be three types namely:

a) A batch produced only once
b) A batch produced at repeatedly at irregulars interval, when the need arises
c) A batch produced periodically at known intervals, to satisfy continuous demand.

Here again planning and control become more simplified as quantities increase and as manufacture becomes more regular. Two problems that may arise in batch production are due to size of batch and due to scheduling of production.

The solution to this problem depends on whether the production is governed by

a) External customer orders only
b) Whether the plant is producing for internal consumption i.e. a subassembly used in the final product.

Characteristics of P.P.C. function in Batch production:

a) Before issuing manufacturing order, need for new raw material and tools, overloading and underloading of particular machines or work centers must be anticipated.
b) As products are diversified and several orders are handled simultaneously in different work centers scheduling and follow of becomes difficult task.
c) Dispatching has to be done efficiently to avoid delays and bottlenecks in the production process.

3) P.P.C. in Continuous Production:

Continuous production is normally associated with large quantities of production and with a high rate of demand. Continuous production is justified when the rate of production can be sustained by the market. Two types of Continuous Production can be :

a) Mass production
b) Flow production

In mass production, a large number of identical articles is produced, inset of advanced mechanization and tooling, the equipment need to be specially designed for the component to be manufactured.

In flow production, the plant and equipment and layout have been primarily designed to manufacture a particular product. A decision to switch over to a different kind of product needs basic changes in the equipments and layout, especially when special purpose machines and complex material handling systems are used.

PPC in Continuous production is usually far simpler that in job or batch production. Extensive effort is required for detailed planning before production starts but both scheduling and control need not be elaborate usually. The output is either limited by available capacity or regulated within even limits to conform to production targets based on periodic sales forecast.

4) Production Planning and control in Process industry:

PPC in process industry is relatively simple. Routing is automatic and uniform. Standards processes and specialized equipments are used. As the products are standardized and goods are produced to stock and sell, scheduling is easy. Departmental schedules are derived from master production schedules. Dispatching involves issue of repetitive orders to ensure a steady flow of materials throughout the plant.

The main task of PPC in process industry is to maintain a continuous and uniform flow of work at the predetermined rate in order to utilize the plant and equipments fully and to complete the production in time.

Requirements of effective Production Planning And Control System:

1. Sound organizational structure with mechanism for proper delegation of authority and fixation of responsibility at all levels.
2. Information feed back system should provide reliable and up-to-date information to all persons carrying out PPC functions.
3. Standardization of materials, tools, equipments, labour, quality, workmanship etc.
4. Trained personnel for using the special tools, equipments and manufacturing processes.
5. Flexibility to accommodate changes and bottlenecks such as shortage of materials, power failure, machine breakdowns and absenteeism of employees.
6. Appropriate management policies regarding production and inventory levels, product – mix and inventory turnover.
7. Accurate assessment of manufacturing lead times and procurement lead time.

8. Plan capacity should be adequate to meet the demand. The plant should be flexible to respond to the introduction of new products, changes in product-mix and production rate.

MAKE OR BUY ANALYSIS

The capacity of the firm to produce finished products depends on at what stage the firm beings the manufacturing process if it starts with basic raw materials, the total output will be much less than if many of the parts and components are purchased form vendors. The form is faced with a decision of whether to make or buy each part or subassembly.

Make or buy decisions are basically questions of specialization and vertical integration. Each and every subassembly has a detailed design drawing specifying the materials and piece parts required to make the subassembly or the raw material required to make the piece part. The process planning engineer has to make an important decision of "Make or Buy" after studying the detailed drawing of assemblies, parts and components.

Many components, subassemblies, and piece parts can be either bought, subcontracted or producing – house.

Consideration in Make or Buy Decision :

In the economic consideration based on cost of manufacture versus cost or buying the item, the least cost alternative is selected. Economic analysis of make or buy analysis is based on Break-even-analysis or Economic Batch Quantity or Economic Order Quantity Concepts.

There are some non economic consideration such as :

a) Availability of supply or alternative sources of supply for components and sub-units.
b) Control of trade secrets and design secretes.
c) Quality and reliability consideration.
d) Research and development facilities available in-house.
e) Delivery schedules to be met.
f) Reliability of supply of outside suppliers.
g) Lead time required for procurement.
h) Availability of manufacturing capacity (in-house).
i) Employee references.

When to Make :

Some of the reasons that may lead a firm to make a product or components in-house instead of purchasing it are:

a) Lower cost because the firm doesn't have to pay for the vendor's overhead or profit.
b) Assurance of availability because the firm doesn't have to depend on vendors.
c) Better control on quality.
d) Availability of appropriate mfg equipment and expertise.

When to Buy :

a) When the part can be bought from the vendors at lower cost, higher quality and faster delivery times than would be possible if the firm made them in-house.
b) When the firm uses only a few numbers of a particular item and special equipments are needed to produce it in-house, then the firm will look for an outside vendor.
c) When an outside vendor can sell an item at a lower cost than the purchasing firm would have to spend to produce it.
d) When the vendors hold patents on the required item.
e) When opportunity cost of producing are much higher than that of buying.
f) When the vendors are able to meet the requirements of the purchasing firm in terms quality, quantity, price and delivery period.

PLANT PLANNING AND FACILITY PLANNING :

How to establish the long-range production capacity to produce the products /services for a firm, is a critical part of setting operations strategy. Land and production equipment may need to be purchased, specialize production technological might have to be developed and new plants may need to be located. The decisions involved have long-lasting effects and are subject to great risk.

The internal arrangement of workers, production processes and departments within facilities is a crucial part of positioning strategy that affect the ability to provide the desired volume, quality and cost of products. Plant planning refers to the designing, installing, and physical arrangement of plants, factories, laboratories, R&D facilities, warehouses, etc. It also included facilities planning or planning of processing equipments, plant utilities and services, plant building or other plant facilities such as communication system, material handling system and storage system.

Facilities planning refers to the determination of how much of long range production capacity is needed, when it is needed, where production facilities should be located and the layout and the characteristics of this facilities.

Importance of Plant Planning :

1. Plant planning is a long range planning which beings with a choice of a suitable location or the site for the plant and end with the installation of the complete production system.
2. The right plant the firm to produce the desired quantity and quality of the products at minimum possible cost.
3. The choice of the plant helps to minimize the capital investment.
4. It provides job satisfaction to employees by providing safe and health working condition.
5. Effective planning and arrangement of plant, equipments, machinery, buildings, etc., is essential to remain profitable in a competitive business environment.

Objectives of Plant Planning :

1. Ultimate objective is to set up an optimum plant system that will provide highest efficiency in manufacturing i.e., at lowest possible cost.
2. An effective integration of all factors affecting the lay out of physical facilities.
3. Efficient utilization of resource such as m/c, labor and space.
4. Logical workflow and smooth sequence of operation.
5. Compactness to minimize movement of material and labour for processing.
6. Satisfaction, safety, and convenience to all employees.
7. Provision of facilities for future expansion.
8. System flexibility to adapt to changes in product design and volume of output.

Considerations of Plant Planning :

1. Production policy of firm regarding what to produce, how much to produce and how to produce. Production policy is turned in governed by factors such as availability of resources, market demand, product range, level to technology, costs and prices and management policy regarding profitability.
2. Input and output data provided to the planners.
3. Assignment of responsibility for each task to competent personnel.
4. Proper integration between building, utilities, communications layout and materials handling.

Scope of Plant Planning :

The scope of plant planning covers planning for all plant and equipments, machinery, facilities and utilities.The major components of plant planning are :

1. Selection of the production system and plant design.
2. Design of plant buildings
3. Manufacturing process design
4. Selection of equipments and machinery
5. Decision of plant layout and shop layout
6. Plant utilities and services
7. Selection of material handling system and equipments
8. Design of communication and control system

The objective of plant planning is to integrate all this elements to install and efficient plant with reasonable flexibility in operating the plant.

Aggregate Planning

Aggregate Planning involves planning the best quality to produce during time periods in the intermediate – range horizon (often 3months to 1 year) and planning the lowest cost method of providing the adjustable capacity to accommodate the production requirements. For the manufacturing operations, aggregate planning involves planning workforce size, production rate (Work hours per week) and inventory levels.

CAPACITY PLANNING

Facility planning includes determination of how much long range production capacity is needed, when additional capacity is needed, where production facilities should be located and the layout and characteristics of the facilities.

Definition of Production Capacity :

Capacity in general is the maximum production rate of a facility or a firm. It is usually expressed as volume of output per period of time.

Capacity indicates the ability of a firm to meet customer demand.

Operations mangers are concerned with capacity because

(a) They want sufficient capacity to meet customer demand in time.

(b) Capacity affects cost efficiency of operations, the ease or difficulty of scheduling output and the costs of maintaining the facility.

(c) Capacity requires an investment of capital.

Types of Capacity :

1. Fixed capacity : the capital assets the company will have at a particular time are known as the fixed capacity. They can not be easily changed within the intermediate range time horizon. Fixed capacity represents an upper limit to the internal capacity that the company can use in its efforts to meet demand.
2. Adjustable capacity : It is on and the size of work force, the number of hours per week they work, the number of shifts and extent of sub-contracting.
3. Design capacity of a facility is the planned rate of output of goods or services under normal of or full-scale operating condition. It is also known as installed capacity. It sets the maximum limit to capacity and serves to judge the actual utilization of capacity.
4. System capacity is a maximum output of specific product or product-mix that the system of workers and machines i.e., the productive system is capable of producing as an integral whole. It is less that or a equal to the design capacity of the individual component because the system may be limited by
   (a) The product-mix
   (b) Quality specifications
   (c) The current balance of equipment and labour
5. Potential capacity is that which can be made available within the decision horizon of the top management.
6. Immediate capacity is that which can be made available within the current budgeted period.
7. Effective capacity is the capacity which is used within the current budget period. It is also known as practical capacity or operating capacity. No plant can work upto the maximum or the theoretical capacity (installed or designed capacity) because of loss of capacity due to scheduling delays, machine breakdown, and preventing maintenance. This results in the plant working at an efficiency less than 100%. Also the actual output will be less that the designed output due to the rejection and scarp.
8. Normal capacity or rated capacity : This is the estimated quantity of output or production that should be achieved as per estimation done by Industrial Engg. department. Actual capacity is usually expressed as a percentage of rated capacity. For example, the rated capacity of steel plant maybe express as one

lakh tones of steel per month. This is also some times called average capacity of the plant.

9. Actual or Utilized capacity : This the actual output during a particular time period the actual output may be less that the rated output because of short-range factors such as actual demand, employee absenteeism, labour inefficiency and low productivity levels.

Measurement of capacity :

Capacity of the plant can be expressed as the rate of output viz., units per day, or per week, or per month, tones per month, gallons per hour, labour hours/day, etc. But for organization whose product lines are more divers, it is difficult to find a common unit of output. More appropriate measure of capacity for such firms is to express the capacity in terms of money value of output per period of time (day, week or month). Capacity may be measured in terms of input or output of the conversion process.

Capacity Decisions :

Major consideration in capacity decisions are:

1. What size of plant? How much capacity to install?
2. When capacity is needed? When to phase-in capacity or phase-out capacity?
3. At what cost? Hoe to budget for cost?

Determination of capacity :

Capacity determination is a strategic decision in plant planning or factory planning. Capacity decisions are important because:

1. They have a long term impact
2. Capacity determines the selection appropriate technology, type of labour and equipments, etc.
3. Right capacity ensures commercial viability of the business venture.
4. Capacity influences the competitiveness of a firm.

Factor affecting Determination of plant capacity :

1. Market demand for a product/service.
2. The amount of capital that can be invested.

3. Degree of automation desired.
4. Level of integration (i.e., vertical integration)
5. Type of technology selected.
6. Dynamic nature of all factors affecting determination of plant capacity, viz., changes in product design, process technology, market conditions and product life cycle, etc.
7. Difficulty in forecasting future demand and future technology.
8. Obsolescence of product and technology over a period of time.
9. Present demand and future demand both over short range, intermediate range and long-range time horizons.
10. Flexibility for capacity additions.

Interrelationship between capacity and other issues :

1. **Relationship between capacity and location decisions:**

   Decisions about capacity are often inseparable from location decisions. Usually capacity expanded by installing new units at new location taking into considerations location factors such as market segment, transportation costs, location of competitors, etc.

2. **Relationship between capacity and plant layout :**

   The plant capacity determines the physical relation between various processes use in the conversion process which in turn determines the layout of the plant. In product-layout or product-focused productive system, the capacities of various work centers or machines have to be balanced to get approximate the same rate of output from various work centers or machines. Once the layout is installed it is not possible to change the capacity in the short term time horizon.

3. **Relationship between Capacity and Process Design :**

   In some cases, the rated capacity depends on the type of the conversion process selected. For example, the conversion processes selected for the manufacture of steel is different for mini steel plants from that use for major steel plants.

4. **Relationship between Capacity and Equipments selection :**

The installed capacity of plant determine the standard labour or equipment hours that can be achieved and also determine the number of machines or equipments that must be installed to get the desired output capacity.

Capacity Planning :

Capacity planning is concerned with defining the long term and short term capacity needs of a firm and determining how these needs will be met.

Need for Capacity Planning :

Capacity planning is necessary when an organization decides to increases its production or introduce new products into the market. Once capacity is evaluated and a need for new or expanded facilities is determined, decisions regarding facility location and process technology selection are taken.

Capacity Planning Decision :

Capacity planning involves activities such as

1. Assessing existing capacity
2. Forecasting future capacity needs
3. Identifying alternative ways to modify capacity
4. Evaluating financial, economical, and technological capacity alternatives.
5. Selecting a capacity alternative most suited a achieve the strategic mission of the firm. Capacity planning involves decisions that must merge consumer demands with human, material and financial resources of the organization.

CAPACITY REQUIREMENT PLANNING (CRP) :

Capacity requirement planning is a technique for determining what labour / personnel and equipment capacities are needed to meet the production objectives symbolized in the master production schedule (MPS) and the material requirement planning (MRP-I).

MRP-I and CRP establish specifically what materials and capacities are needed and when they are needed.

Capacity Requirement planning (CRP) Process :

End item requirements arising from the aggregate plan and MPS are exploded in to tentative planned order for components by the MRP system. The CRP system converts those order into standard labour and machine hour of load on the appropriate workers and on the machines as identified from the work centers status and shop routing files. The output is a load-projection report work centre wise. If the work center capacities are adequate, the planned order releases are verified for the MRP system and release orders become purchase and shop orders. Work loads reports are also used for controlling input or output. If the initial load projection reports reveals in adequacy of capacity in any work center, either the capacity must be increased (By using overtime or subcontracting) or the master production schedule must be revised.

CRP inputs The major inputs of CRP process are

- Planned orders and released orders from MRP system
- Loading information from the work center status file.
- Routing information from the shop routing file
- Changes, which modify capacity, give alternative routings or altered planned orders.

MASTER PRODUCTION SCHEDULING:

The master schedule (or master production schedule or MPS) sets the quantity of each item (finished product) to be completed in each time period (week or month) of the short range-planning horizon. Master production schedules are developed by reviewing market forecasts, customer orders, inventory levels, facility loading, and capacity information regularly. The MPS is a plan for future production of end items over a short-range planning horizon that usually spans from a few weeks to several months. It is an important link between marketing and production.

Objectives of Master Production Scheduling :

- To schedule end item to be completed promptly and when promised to customers.
- TO avoid overloading or under loading the production facility so that production capacity is efficiently utilized and low production costs results.

Function of Master Production Schedule :

The MPS formalizes the production plan and converts it into specific material and capacity requirements. This leads to the assessment of labour, material and equipment needs for each job. Then the MPS derives the entire production and inventory system by setting production targets and responding to feedback from all downstream operations. It is the beginning of all short-range production planning. from the MPS, material requirement planning (MRP) develops short range schedules for producing parts that go into the end items in every work center of the production system. The MRP develops short-range plans for purchasing the raw materials and components that are required to produce the product.

Some key functions of MPS are:

- Translating aggregate plans into specific end items,
- Evaluating alternative schedules,
- Generating material requirements,
- Generating capacity requirements,
- Facilitating information processing,
- Maintaining valid priorities,
- Utilizing capacity effectively.

INTEGRATED MATERIAL MANAGEMENT :

Introduction :

Integrated Material Management can be defined as a systems approach in planning, procurement, storage and material handling, with the objective of optimizing the company's investment in materials. Conventionally, objective of the material function has been to ensure that the right quantity of material, of the right quality has to be received at the right time from the right source at the right price. To achieve these objectives, there are separate activities and sub-activities, such as material planning inventory control, purchasing source development, vendor rating warehousing, and disposal.

In the context of Total Quality Management (TQM) the key objectives of Materials management are getting refined to:

a) Internal Customer satisfaction
b) Cost reduction by elimination of waste

c) Contribution to reduction of cycle time for product development including new products

d) Inventory and Logistics Management.

Integrated materials management functions :

a) **Material Planning and Control** : This function deals with determining requirements of raw materials, components consumables for the purpose of production, taking in consideration :

- Required service level i.e. material availability as and when required by the user.
- Optimum inventories or in other words the minimum possible inventory for maximum service level.

Material planning and control is based on a number of selective inventory control techniques. The most commonly known is the A-B-C analysis i.e. separating the vital few from the trivial many. Another important analysis is V-E-D analysis i.e. Vital-Essential-Desirable.

b) **Purchasing:** The purchasing department's activity takes off from the receipt of material indents or requisitions from the materials planning. In case of one time requirement of capital purchases, the requirements to the purchase dept will be directly communicated by users in the form of purchase requests. It is the responsibility of the purchase dept to decide commercial terms for economic purchases, by proper analysis of the requirements indicated, selection of right source and scheduling the delivery taking into account the lead-time involved.

c) **Stores:** The store receives bins and issues materials. To this extent, stores will be responsible for proper housekeeping; preservation of material received and keeps proper control of materials. Major functions of the stores include:

- Receiving raw materials, components, consumables, packaging materials etc.
- Warehousing the items in identifiable locations once the materials are accepted.
- Accounting the transaction.
- Minimize obsolescence by following proper system like FIFO and good housekeeping.
- Transportation of materials particularly finished goods.

PLANT LAYOUTS

Introduction :

Plant layout is the most effective arrangement and coordination of physical plant facilities to allow greatest efficiency in the combination of men, materials, and machine for operating any manufacturing unit.

Layout of plant has been defined as “a floor plan for determining and arranging the desired machinery and equipment of a plant, where established or contemplated, in the one best place, to permit the quickest flow of material at the lowest cost and with the least amount of handling in processing the product from receipt of raw materials to shipment of finished products.”

Factors for Consideration before a Good Layout can be contemplated :

1. **Products** : Description, shapes, size, weight quantity specifications, quality-foe the present as well as for future planning say 5-10 years. Changes in the design-effect on manufacturing sequence, machinery, effect on material handling on other factors.
2. **Production Planning** : Directly affects the material flow and the layout of physical facilities. Process method and sequences for the current future production to be considered.
3. **Production system** : Whether jobbing or batch production-continuous process-layout of machine and facilities. Wanted Change for jobbing type-function layout ‘Mass Scale Production-Line or Product, Repeat Order for same or similar type. Combination of two types of layout would be good.
4. **Purchase and Inventory Policy** : It will have a direct effect on the materials and part storage and on material handling for above space required for storage and inspection and hence bearing on facilities layout.
5. Material Handling System : Such as manual/mechanized movement and types of handling devices to be used-has influence on types of layout. The system however shall have a bearing on production system.
6. **Technological Change :** New machines improve higher output and economy. There shall be corresponding changes in process sequence and product quality, may cause changes in the product range, which was not possible with the old technology. Each change effects the layout facilities.
7. **Safety** : Safety provision at each work center and relation location of facilities as demanded by safety considerations, affect the layout. Meeting only layout needs of personnel, production, and workflow is not enough.

8. **Maintenance** : A good layout provides better facilities for maintenance.

Types of Layout :

Following categories of layout of production facilities exist in manufacturing organization :

1. Process of functional layout
2. Product or line layout
3. Fixed position layout

- **Process Layout :** Arrangement where machines doing the same process are kept together, e.g., in machine shop all lathes located in one area in another area milling machines, in another area all drilling machines, inspection in one area and assembly in another area. Relative location of these department or areas may be such as to suit normal sequence of operations in machining of parts. Intermittent production system follows process layout.
- **Product Layout** : This is an arrangement where the machine are laid out in a way that suits the how of production in one line without having to have any back tracking or zigzag movement e.g., in producing one part the operation involves turning, milling, drilling and milling-the machine shall be laid out in a sequence of operations. Say, first lathe, then milling machine. For this the products shall be large in numbers, to last long (i.e. Demand).
- **Fixed Position Layout** : This is used mostly in case of large ships, aircraft. Here the products are stationary but men, machines and tools move from location to location. Conditions when the process layouts are generally found to be more economical are :

1. When the company produces small quantity that needs few days or weeks to produce. Several different products are to be manufactured which also keep changing i.e., product life is short.
2. When the production capacity is limited and there is need to load difference kind of equipment to their full or near full capacity.
3. When the average numbers of operations on products are not too many and handling costs are small.

PLANT MAINTENANCE

Introduction :

Plant implies all physical means of production in a manufacturing system. These can be machine tools, fixtures, land, building and other facilities. These facilities are subject to deterioration due to their use and exposure to environmental conditions. The process of deterioration, if not checked or rectified or reconditioned may take these facilities unserviceable after some time, this checking or rectification is done through the process of maintenance. Thus maintenance means to maintain the facility in the system up to desired level of efficiency i.e. to keep assets in a satisfactory condition or restore these to the condition. Maintenance ensures conditions of the facility such that it permits uninterrupted implementation of plan requiring their use.

Objectives of Plant Maintenance :

The management of maintenance activity has to concern itself with provision of interrupted production process at minimum cost and maximum reliability. The following are the objectives of plan maintenance:

- To maximize the amount of time the assets will be available for use for the purpose for which these were procured.
- To preserve the value of assets by reducing the rate of at which they deteriorate.
- To perform the activities of maintenance in the most economical manner.
- To plan and schedule maintenance work so as to anticipate and prevent interruptions in operations.

Types Plant Maintenance :

Plant maintenance strategy can be broadly classified in to two classes viz. Breakdown maintenance and preventive maintenance.

Breakdown Maintenance :

This is also known as Corrective maintenance. For non-critical equipments it is usually the policy to allow it to run without much routing attention.

Breakdown maintenance practice is economical for those equipments whose down time and repair costs are less. It is administratively easier and needs smaller staff. The causes for breakdown can be :

- Failure to identify and replace worn-out parts.
- Lack of lubrication.
- Inefficient or neglected cooling system.
- Too low or too high voltage.
- Use of sub-standard or wrong fuel.

Disadvantages of Breakdown Maintenance :

- It results in dislocating production process and cause excessive delays or reduction in output.
- Wages are to be paid for idle time resulting in loss profit.
- There may be more material wastage.
- Failure of machine can cause accident leading to loss of life.

Preventive Maintenance :

All machine deteriorate with use an exposure, deterioration of machines implies change in dimensions of it various components and weakening of its members due to fatigue, impact and corrosion. Such deterioration indicated by :

- Inability of the machine to take specified load.
- Reduction in the speed of the machine.
- Deterioration in quality of the output by any machine.
- Reduction in operational life of the machine.

Preventive maintenance is an activity which prevents breakdowns, cut operating costs and improve quality of the product.

Advantages of Preventive maintenance :

- Less production downtime because of fewer breakdowns.
- Lesser overtime payment for maintenance worker and repairs than for breakdown repair.
- Fewer large scale repairs and fewer repetitive repairs.

- Fewer product rejects, less spoilage, better quality control.
- Reduction in maintenance cost.
- Lower unit cost of manufacture.
- Ensures greater safety of worker.

Total Productive Maintenance :

Total Productive Maintenance (TPM) is a maintenance program concept. Philosophically, TPM resembles Total Quality Management (TQM) in several aspects, such as

- Total commitment to the program by upper level management is required.
- Employees must be empowered to initiate corrective action.
- A long-range outlook must be accepted as TPM may take a year or more to implement and is as on-going process.

The dual goal of TPM is zero breakdowns and zero defects. When breakdowns and defects are eliminated, equipment operation rates improve, costs are reduced, inventory can be minimized, and as a consequence labor productivity improves.

A complete definition of TPM includes the following five elements :

- TPM aims to maximize equipment effectiveness.
- TPM establishes a through system of PM for the equipment's entire life span.
- TPM is implemented by various departments. (engineering, operation, maintenance)
- TPM involves every single employee, from top management to workers on the shop floor.
- TPM is based on the promotion of PM through motivation; autonomous small group activities.

TPM is a concept of maintenance, which encompasses the entire organization. It aims to eliminate breakdown and defects by participation of everyone in the organization.

QUALITY CONTROL / QUALITY ASSURANCE

Quality can be defined as the total composite product and service characteristic of marketing, engineering, manufacture and maintenance through which the product and service in use will meet expectations of the customer.

Quality is determined by the following characteristics of a product or service :

1. Reliability
2. Serviceability and maintainability
3. Safety
4. Attract ability

Quality control / Quality Assurance is an effective system for integrating the quality development, quality maintenance, and quality improvement efforts of the groups in an organization so as to enable marketing, engineering, production and service at the most economical levels, which allow for full customer satisfaction.

Meaning and procedure of Quality Control / Quality Assurance :

Total Quality control is a process for delegation of responsibility and authority for a management activity while retaining the means of assuring satisfactory results.

There are four steps in Quality Control :

Steps For Quality Control / Quality Assurance :

Step 1: Setting Standards:

- Determine the required cost-quality, performance-quality and reliability-quality standards for the product.
- This is done by collecting the present data, analyzing the cost, performance, reliability, and safety qualities of each department and setting realistic targets on the basis of data collected. It also takes help of Quality function Deployment.

Step 2: Appraising Conformance :

- Comparing the conformance of the manufactured product or service offered to the above standards.
- This step makes use of statistical tools like control charts.

Step 3: Acting when necessary :

- Correcting problems and their causes throughout the full range of those marketing, design, engineering, production, and maintenance factors, which influence user satisfaction.

Step 4: Planning for improvements :

- Developing a continuous effort to improve the cost, performance, safety, and reliability standards.

Scope and Jobs of Quality Control / Quality Assurance :

The quality control believes that control must start with identification of customer quality requirements and end only when the product has been placed in the hands of the customer who remains satisfied.

Total quality control guides the coordinated action of people, machines, and information to achieve this goal.

Thus the scope of quality control is all stages of the industrial cycle:

1. Marketing evaluates the level of quality which customers want and for which they are willing pay.
2. Engineering reduces this marketing evaluation to exact specifications.
3. Purchasing chooses, contracts with, and retains vendors for parts and materials.
4. Manufacturing selects jigs. Tools, and processes for production.
5. Manufacturing Supervision and shop operators exerts a major quality influence during parts making, subassembly and final assembly.
6. Mechanical inspection and Functional test check performance of products by comparing conformance to specifications.
7. Shipping influences the caliber of packaging and transportation.

8. Installation and product service help ensure proper operation by installing the product according to proper instructions and maintaining through service.

AVDEL (INDIA) PVT. LTD. -
MACHINE SHOP PRODUCTION PLANNING & CONTROL

AVDEL (INDIA) Pvt. Ltd. is a fasteners Manufacturing company (Blind Rivets manufacturing), unit located at Wagle Industrial Estate Thane (West). Following are the core production processes :-

1. Cold Forging (Shells)
2. Cold Forging (Nails)
3. Degreasing (Shells)
4. Annealing (Shells)
5. Polishing & Drying (Shells)
6. Assembling (Shell & nail)
7. Crimping (Shell & nail assembly)

Also Supporting Activities to the production processes in the shop floor are :

1. Quality Assurance,
2. Tooling Management
3. Maintenance
4. Production planning and control
5. New Product Development
6. Product Supply Management
7. Stores management
8. Purchasing
9. Stores Management
10. HR Admn & Training
11. Packing & Dispatch.

The list of Production machines / equipments is as under:

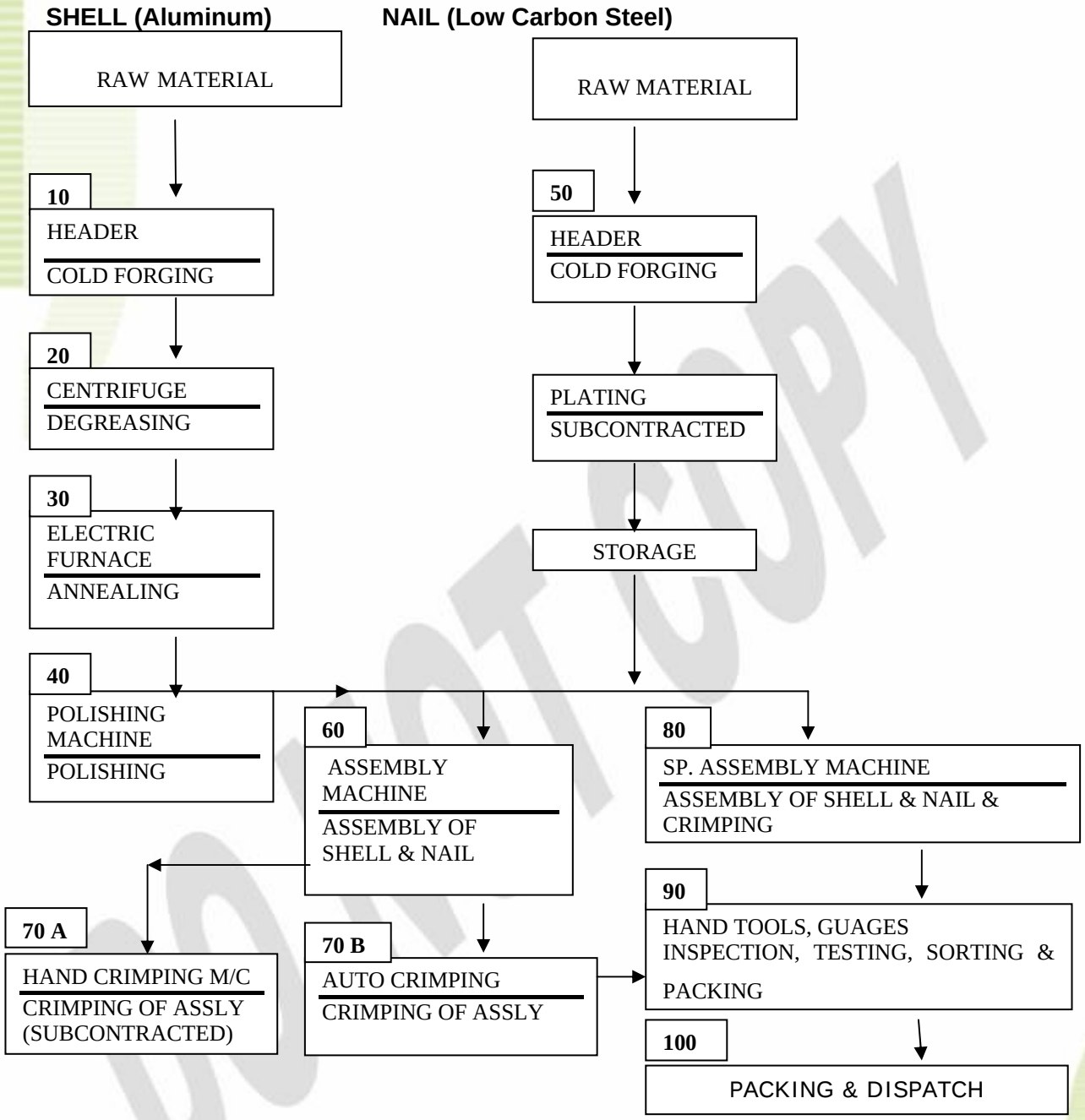
Sr no	Machine / Equip. Name	Remark / Function	Location
1	Header-D	Shell forging	Shop floor
2	Header-B	Shell forging	Shop floor

		(PLC control)	
3	Header –A	Shell forging Special (LF)	Shop floor
4	Vibratory Bowl - Polishing	Polishing	Shop floor
5	Mini Dryer	Drying	Shop floor
6	Centrifuge	Removing oil	Shop floor
7	Furnace No.1	Annealing	Shop floor
8	Furnace No.2	Annealing	Shop floor
9	Nail P New m/c	Nail forging	Shop floor
10	Nail P Old m/c	Nail forging	Shop floor
11	Nail R New m/c	nail forging	Shop floor
12	D Assembly m/c	Assembling	Shop floor
13	P Assembly m/c	Assembling	Shop floor
14	Crimping m/c	Crimping	Shop floor
15	Old A/A & Crimping m/c	Assembling & crimping	Shop floor
16	New A/A & Crimping m/c	Assembling & crimping	Shop floor

In shop floor the other machines / equipments supporting to core production activities are Lathe m/c, Drilling m/cs, Surface grinder, Bench grinders, Hand press, Tensile testing m/c, Hardness tester, Shadow master, Weighing scales, Air compressors, Vibratory bowls (sorting bowls).

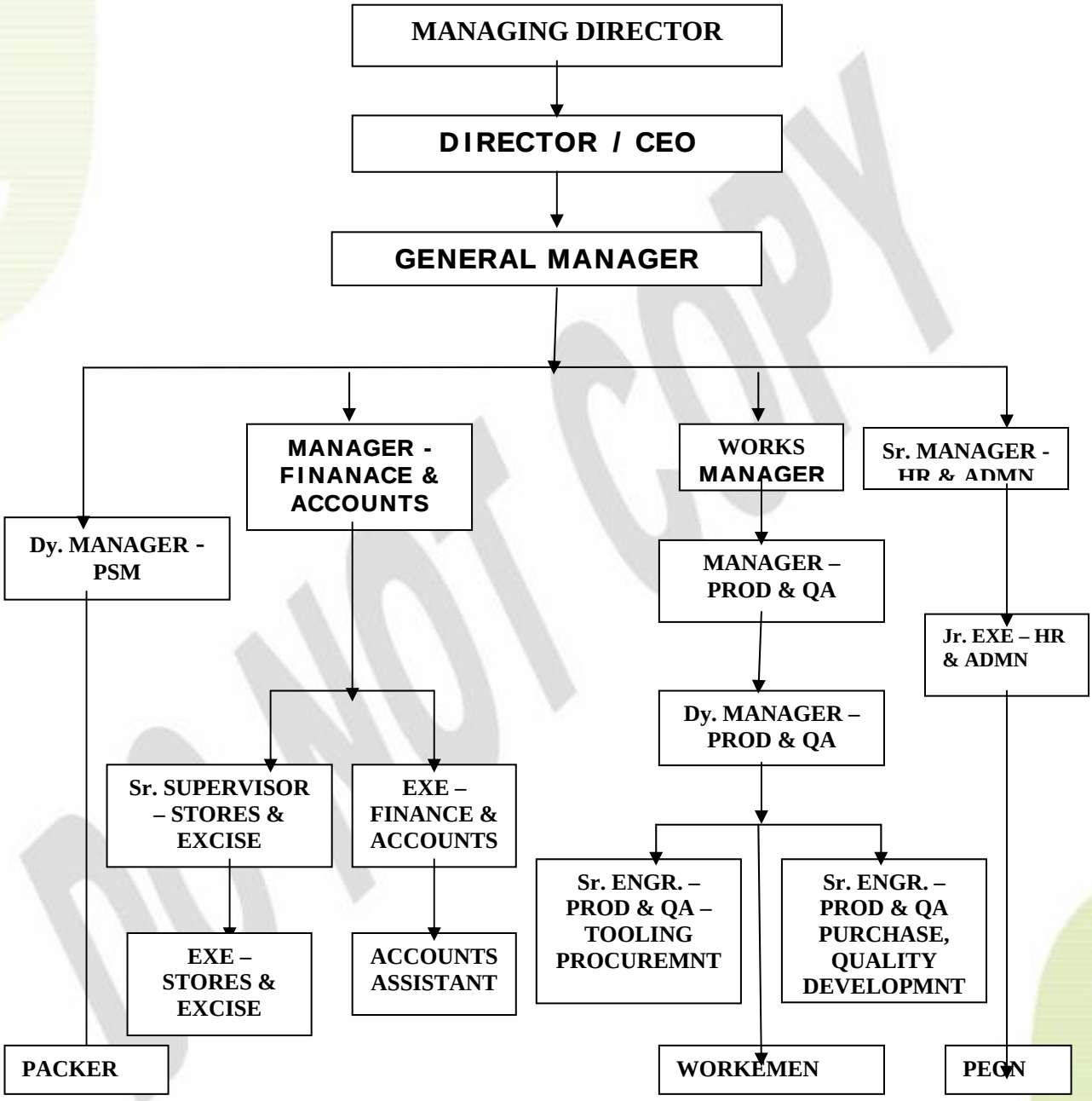
The process flow chart for core production processes / operations is as under:

PROCESS FLOW CHART
(CORE MANUFACTURING PROCESSES)



The Organization flow chart is as under:

ORGANISATION FLOW CHART



Responsibilities of key personnel are identified and are as under :

1 WORKS MANAGER :

- Responsible for Production/ Quality Assurance and Purchase Activities.
- Production Planning.
- Control of Manufacturing Process.
- Applications of Statistical Technique as appropriate.
- Taking Corrective and Preventive Actions.
- Dispossession of Non-conformities.
- To initiate actions to prevent the occurrence of any non-conformities relating to Product, Process and Quality System,
- To initiate, recommend or provide solutions through designated channels.
- To verify implementation of solutions.
- To control further processing / assembly or delivery of non-conforming product until the deficiency or unsatisfactory condition has been corrected.

2 DY. MANAGER – PSM

- Confirming Order with customers.
- Preparing and forwarding proforma to customers
- Preparing Challans and Invoices.
- Packing and Dispatch.
- Preparing Pending Order, Schedule of Dispatches monthly reports
- Preparing Sales Plan / Production Plan
- Intimation of sales when orders are completed.

3 MANAGER (PRODUCTION):

- Overall supervision for Production/ Inspection and Maintenance activities.
- Receiving, In-process and Final Inspection.
- Calibration of Measuring and Test equipments.
- General housekeeping.
- Preparation of Daily Production Report.
- Preparation of Indent and Material Issue note.
- Train & Guide the operators in setting of machine.

4. Sr. ENGINEER - PRODUCTION & QA :

- Managing the production activities in shift.
- Allocate the operators on machine.
- Check the Quality of products in process.

- Arrangement of Raw Material, Tools & Spares.
- Train, Guide, & help the operators in setting & maintenance of machines.
- Organizing shifting of materials in allocated areas.
- Identify and record any problems relating to Product, Process, and Quality Systems.

12. SUPERVISOR (STORES):

- Issue & Receipt of materials
- Stamp GRN cum Inspection Report on backside of challans.
- Forward such challans to QA to obtain Inspection Reports.
- Maintenance of stores related documents.
- Stocktaking.
- Preparation of Gate passes.

PLANNING & QUALITY OBJECTIVES

Quality & Business Objectives are defined for each core process of Avdel (India) Pvt. Ltd so as to ensure effective implementation of these processes. The objectives are consistent with Quality Policy. Targets for Objectives are decided by, the Unit In-charge with HODs. Quantification of objectives is recorded in Quality Objectives monitoring chart. These objectives are reviewed for achievements & relevance in management review. Quality & Business objectives will lead to Quality & Productivity Improvements and maintaining best levels of Quality & Productivity.

Unit In-charge keeps the records of achievement of quality & productivity objectives every 6 month. Data / trends related to quality objectives are updated on monthly basis, so as to ensure effective implementation of decided action plans. Short term & Long term Business Plan has been defined in accordance with Quality Plan. Business Plan is confidential document & is kept with C.E.O., who ensures that Quality Objectives are set & reviewed so as to achieve Business Plan. Necessary controls over the processes & monitoring method is defined in relevant process documents.

QUALITY POLICY

We at **Avdel** believe that Total Quality ensures absolute Customer Satisfaction. This is accomplished through Timely Deliveries of Perfect Product and Prompt Responses to Customer's Queries. We firmly believe in the "**Quality Improvement**." We strive to achieve higher level of efficiencies. Our experience will enable us to take necessary steps towards Continual Improvements.

QUALITY PLAN :

Sr no	STAGE OF PRODUCT REALISATION	VERIFICATION PARAMETER	ACCEPTANCE CRITERIA	OTHER REFERENCE DOCUMENT
01	UNDERSTANDING CUSTOMER REQUIREMENTS	TECHNICAL & COMMERCIAL FEASIBILITY TO FULFILL REQUIREMENTS	REQUIREMENTS UNDERSTOOD & ARE FEASIBLE	CUSTOMER ENQUIRIES
02	PURCHASING	PURCHASING SPECIFICATIONS & DELIVERY SCHEDULE	SPECIFICATIONS CLARIFIED TO SUPPLIER DELIVERY SCHEDULE INFORMED.	PURCHASE SPECIFICATIONS / SUPPLIER CATALOGUES
03	RECEIVING INSPECTION	MATERIAL PRODUCT RECEIVED	MATERIAL PRODUCT ACCEPTABLE AS PER SPECIFICATIONS	INSPECTION PLAN
04	MANUFACTURING / ASSEMBLY & IN-PROCESS INSPECTION	PRODUCTS MANUFACTURED AS PER INTERNAL SPECIFICATIONS	PRODUCTS ACCEPTABLE AS PER SPECIFICATIONS	INSPECTION PLAN
05	FINAL INSPECTION	PRODUCT DIMENSIONS / FUNCTIONAL ASPECTS	PRODUCT ACCEPTABLE AS PER CUSTOMER REQUIREMENTS	INSPECTION PLAN
06	PACKING & DISPATCH	PRODUCT HAS PASSED ALL ABOVE STAGES & IS ACCEPTABLE	TIMELY DELIVERY	DELIVERY SCHEDULE

DOCUMENT CONTROL

Product Drawings :

- Works Manager is responsible to prepare in-house drawing based on technical data of Avdel.
- Prepared & approved drawings and distributed the drawings for Manufacturing.
- Maintained the list of drawings developed in-house along with the issue status.

Tools and spares drawings :

Works Manager prepared in-house drawings / sketches for tools/ spares and maintained the list of such drawings / sketches along with issue status.

RESOURCE MANAGEMENT

It ensures availability of necessary resources for proper implementation of Quality Management System so as to meet customer requirements

HUMAN RESOURCE MANAGEMENT:

Competence of personnel performing work, which affects Product and Service Quality, is ensured. Procedure for training defines method for identifying training needs & achieving competence of all personnel performing activities affecting product quality. It is ensured that personnel performing tasks are qualified. Necessary training including 'on the job' training shall be given to satisfy these needs.

Training needs identified on the basis of competency requirements & those identified By HODs.

Competency requirements for various activities / levels are identified.

The training needs of employees shall be assessed through the following considerations :

1. Periodic interaction with the employee.
2. Development in the technology.
3. Development of new product or process or systems.
4. Skills required to perform the activity.
5. Quality improvement projects.
6. Special job requirement, etc.

The section In-charge identifies the training needs of the employees may indicate the source for providing the training. Section In-charge & Sr. Manager Admn. & HRD

jointly decides the yearly Training Schedule. The identified training is arranged either from outside faculty or with the help internal faculty in the company.

Effectiveness of the training imparted is evaluated. The evaluation is done for the training course by HOD. The section in charge of respective department does the evaluation of training given to employees of his section.

Works Manager reviews level of staff member's motivation / empowerment at least once in a year. Records are maintained. Prod. Manager reviews level of motivation / empowerment in workers every year. This is done mainly on the basis of Quality Objectives achievements & efforts for the same by concerned personnel.

INFRASTRUCTURE MANAGEMENT:

Necessary work space is provided for each activity i.e. appropriate storage area of each processing stage, sufficient space in shop floor for material handling / storage, sufficient office space etc. Plant, facility & equipment plans are developed by cross functional teams, with an objective to optimize material travel, handling, and value added use of floor space & facilitation of synchronous material flow. Necessary supporting services are ensured such as

- Transportation for inward Raw Material & dispatch of finished goods.
- Material Handling systems
- Office equipment such as Computers, fax, telephones etc.

Necessary processing equipment & utilities are maintained.

Contingency plans have been developed for rivets manufacturing, so as to satisfy customer requirements in event of emergency such as utility interruptions, labour shortages, key equipment failures, & field returns.

WORK ENVIRONMENT MANAGEMENT

Good housekeeping & safe working environment is maintained throughout organization. Necessary safety equipments such as fire extinguishers are provided. Product safety & personnel safety is ensured during development and mfg. processes. These requirements is as addressed in relevant operator instructions. First aid box is provided. Housekeeping will be in keeping with quality standards. Cleanliness of premises shall be maintained with respect to product & mfg. process requirements.

CONTINGENCY PLAN

Sr no	Process / Description of Risk	Probability / Cause	Contingency plan to take care of risk	Remarks
1	Breakdowns	Due to any breakdown in the m/c.	Plan to keep breakdown spares & consumable tools ready & to be easily available	Breakdown spare & consumable tools kept ready.
2	Absence of operator	Due to sickness or any other reason	Train each operator to run most of the m/cs. so that in absence of specific operator other can operate the m/c. Also supervisor run m/c.	Each operator run 2 to 3 m/cs. supervisors also run the m/cs
3	Shortage of specific raw material grade	1. Due to transport delays 2. Due to processing.	Plan to order the reqd. quantity of raw material in bulk well in advance. Also inform the processor the schedule to process the raw material well in advance. Also develop new raw material supplier & processor to avoid any problem.	Ordering raw material in bulk. Giving schedule for processing the raw material. 2 suppliers for raw materials
4	Power Interruptions	Due to several electrical power cuts & breakdowns from MSEB.	Add more machines. Run extra m/cs, whenever power is available. Develop vendor / sub-contractor for the product (outsourcing)	Running extra shifts. SGB & RDJ are planning to add more m/cs.
5	Subcontractor delays	Due to processing.	Develop new sub-contractors.	4 sub-contractors
6	Field Returns	Due to non–conformance.	Analyze the problem, & take corrective as well as preventive actions	No field returns since APRIL-04

INTERNAL AUDIT

M.R. plans the Internal Audits for six months. Every Department is audited at least once in six months.

M.R. gives consideration to importance of the activity and the kind of non-conformities found in previous audits, in that particular area, for deciding the duration of Internal Audits for that area.

M.R. appoints a team of trained auditors for auditing task. List of trained Internal Auditors is maintained. The scope of audit is explained to the auditors by M.R. Scope of

audits include areas to be covered. The auditors are appointed for particular department / section such that, they are independent of the area being audited.

The records of internal audits and summary reports are maintained for Management Review.

Manufacturing Process Audit :

Each manufacturing process is audited at least once in 6 months to ensure :

- Availability of necessary resources / information.
- Quality inputs are received.
- Process is carried out as per Control Plan / Work Instruction.
- Output is carried as per expectations of internal / external customer.
- Effectiveness / efficiency of process is monitored & indicates it's ability to meet set targets.
- Internal / External customer concepts are known to process owner & operating level personnel & efforts are taken to overcome the same.
- Continual improvement of process is planned & achieved.
- Records of mfg. Process Audit are maintained.

Product Audits :

Product Audit of packaged finished product ready for dispatch is conducted every 6 months. Product Audit Ensures:

- Proper labeling & packing of products.
- The product is acceptable for dimensional, visual, & functional aspects.
- The product has passed through each mfg. stage & is acceptable at each stage.
- Traceabilty to raw materials sources is maintained.
- Records of product audit are maintained.

MAINTENANCE:

Manager - Production is overall responsible for implementation of Maintenance. Preventive Maintenance schedule & Predictive Maintenance Work Instructions are defined. Operators are responsible for carry out daily maintenance of machine with relevant work instructions.

Verbal intimation in case of breakdown maintenance due status of machine as per preventive maintenance schedule.

At the end of shift, production supervisor mentions condition of machine with specific reference in logbook. Production In-charge receives verbal information about breakdown of any m/c from the operator.

Production Supervisor studies the causes of breakdown and if possible carries out maintenance with help of operators. If it is not possible maintenance activity can be sub-contracted in consultation with Production Manager / Works Manager.

After completion of work of Sub-contractor Production Supervisor check repair, adjustment, till satisfactory trial by operators. Manager Production records maintenance activities, any spares replaced in, Machine / equipment History Card. Manager – Production maintains preventive maintenance plan cum record ensures completion of required maintenance activities.

Air receivers are tested every year as a statutory requirement. Fire extinguishers are Verified & refilled every year.

Work Instruction identifies common abnormal signs, which may be observed during any Mfg. Process. Predictive Maintenance Activities may be carried out based on these abnormalities. Records of Predictive Maintenance Activities are maintained. For all critical replacement parts min. stock level is maintained. Preservation & packing of Machines / Equipments etc. is done. Availability of machines / equipments for production is output of this process.

Effectiveness of maintenance process is monitored through trends in % OEE, maintainability & reliability on monthly basis. Bar graph is used for the same.

PRODUCTION & SERVICE PROVISION:

Manufacturing assembling of rivets is carried out as per manufacturing / assembling stages defined in Quality Plan. Required drawings, specifications, & Work Instructions are made available at relevant workstations. Manufacturing of rivets is carried out under controlled conditions as defined in Work Instructions.

Work Instructions for each mfg. process / related work for rivets mfg. also includes :-

- Work environment requirements including product / personnel safety.
- Reference to Manufacturing Process sheet & controlling parameters / special characteristics.
- Job set up followed by verification.
- Tool control
- Process Activated Maintenance

- Operation stages
- Actions for non-conformities
- Actions for emergency
- Identification & Traceability
- Consequences to customers of non-conforming products.

Manufacturing is carried out with appropriate tools, machines, & equipment. Performance of Process Control parameters & product are monitored with help of suitable monitoring & measuring devices as stated in Quality Plan. The products are monitored & inspected at relevant manufacturing / assembling / servicing stages. For rivet manufacturing processes Job setup verification is performed during initial run of job, material change over.

CONTROL PLAN:

Pre-launch & Production Control Plan are developed based on PFMEA outputs; for all products manufactured at system, subsystem & component levels including all stages of mfg. A typical control plan includes details such as:

- Controls used for manufacturing process control
- Methods of monitoring customer designated / Avdel defined special characteristics for products / processes.
- Customer required information if any,
- Reaction plan when process becomes unstable of statistically incapable.

Control plans are reviewed & updated based on changes in product design / mfg. processes / measurement methodology / Logistics / supply sources / PFMEAs etc. There are processes, which need validation e.g. Plating, heat treatment at supplier's premises. For such processes, process validation is carried out. Production processes are validated at the time of process design and development of new product. Revalidation of each manufacturing process is done once in a year.

MONITORING AND MEASUREMENT OF RIVETS MANUFACTURING PROCESSES:

Any new manufacturing process is qualified prior to regular production. Process qualification ensures process capability as expected by customer or as decided by AVDEL. This is done as a part of Process Design & Development part of APQP. Process control parameters, inspection / test methodology, machine maintenance program etc.

are decided on the basis of process validation studies. Manufacturing Process objectives / targets, including targets for process capability, reliability, maintainability, availability as applicable and acceptance criteria is defined. Control plan & process flow diagrams are prepared for each type of product; which include measurement techniques to be used,

MONITORING & MEASUREMENT OF PRODUCT:

Important product characteristics shall be monitored & measured at different stages of product realization / processing as mentioned in Quality Plan / Inspection Plan. Criteria for acceptance & frequency of inspection is as defined in relevant product / stage inspection plan or with products specifications.

Test certificates are obtained from important Raw Material suppliers / sub - contractors. The test certificates are verified to ensure compliance with requirements. No product is released for dispatch till it is inspected & inspection results are satisfactory. Records of inspection & testing activities are maintained. Inspection / testing records are indicate approving authority for product release at each stage.

PROCESS CONTROL:

It is ensured that production is planned & carried out under controlled condition to achieve the required quality in manufactured product.

G. M. is responsible for Production Planning & Monitoring of the Production Process & Implementation. The shift supervisor is responsible for daily production process & maintenance.

G. M. receives Pending Order, Delivery schedule from Marketing Department. Production Plan is prepared based on schedule / requirement received from marketing department. Manufacturing lead-time is established by experience & is used for scheduling production activities so as to ensure continuous material Flow leading to 100% timely delivery.

Material Planning:

Based on past experience raw material is procured. Production supervisor draws material from stores on requisition slip. The following critical production processes are identified:-

8. Cold Forging

9. Degreasing
10. Annealing
11. Polishing & Drying
12. Assembling
13. Crimping

Production Supervisor ensures the following before starting the production:

1. Valid machines / Equipment are used
2. Calibrated measuring devices are used for measurement
3. Work instructions / drawing are available near the machines are appropriate
4. Whether essential representative samples / drawings are kept.
5. Compliance with reference Standards / Codes & Quality Plans and / or documented procedures.
6. Machines are suitably maintained.
7. Availability of Control Plan describing necessary Control over processes to obtain expected product results & special product/ process characteristics.

To get required profile / size shells & nails are cold forged. Shells are forged as per Work Instruction. Inspection results are hourly-recorded. Shells are degreased in centrifuge machine to remove excessive oil & to avoid air pollution while annealing. To relieve stresses of cold forging shells are annealed temperature and cycle time is recorded. Shells are polished & dried in mini dryer. Nails are subcontracted for plating for better appearance only. Plating is special process carried out at subcontractor's premises. As & when necessary plating process is qualified. To form Blind Rivets shells & nails are assembled. The following parameters are to be checked:

a) Gap between shell & nail head
b) Concentricity of shell & nail
c) Projected length of nail

The parameter mentioned in a, b & c are recorded.

The Batches of Standard and Non Standard Blind Rivets, after keeping work load for in house assembly machine and for crimping machines the balance quantity of Shell / Nail / Assembled Rivets are forwarded to vendors for Hand Assembly, Crimping & Sorting process. For the Batches of Multigrip Blind Rivets and of Non-standard Blind rivets Crimping is done & tested for the function of Blind Rivet with handgun & for fitment test results are recorded.

For the Multigrip Blind Rivets batches, Assembly & Crimping is done & tested for the function of Blind Rivet with handgun & for fitment test results are recorded. If required for the batches of standard and Non Standard Blind Rivets-(Assembled / In-house Crimped Rivets) are forwarded to in house / suppliers for sorting work.

Work Instructions as above include operation stages Daily Preventive Maintenance Activities, actions in case of non-conformities; actions in case of emergency etc. setting instructions are separately prepared.

Production Supervisor prepares Daily Production report machine wise & shift wise indicating quantity produced in Kgs & in nos. including loss of production hours recorded in register.

After the final operation, the Standard and Non Standard Blind Rivets produced (finished product) are forwarded for final Inspection.

Lathe machine / Radial Drill and Surface Grinder are not directly linked with production of finished products. These machines are used for maintenance and tool preparations.

Control of Production Tooling:-

- Tool drawings are prepared for each tool & tools are maintained accordingly.
- During issue to production & after completion of production run tools are inspected visually.
- Tool condition is also verified indirectly through product inspection.
- Tool life/consumption is monitored periodically & efforts are taken to improve tool life.

Product ready for next stage of production is output of each in-process stage. Product ready for packing is final output of production.

MANAGEMENT OF PRODUCTION TOOLING:

Unit In-charge ensures availability of necessary resources for tool / gauge design, fabrication & verification activities. Tool drawings indicating latest change level are maintained. Review & Re-approval is done by, Unit In-charge. Whenever any rectification is done in any tool, it is followed by re-inspection. Tool life is monitored for each type of tool. Each tool is identified by unique tool no., which is also identified in the list of tooling / gauges. Production tooling is stored in racks provided near relevant machines to ensure easy recovery whenever required. Tools under repairs or to be disposed are identified by, 'Tool Change Tag'. Tool setup instructions are included in relevant Work Instructions. For perishable tools min. stock level is decided. Tool life has been established, tool verification and change is arranged accordingly. Tool verification is carried out by means of In-process inspection. Packing & dispatch of finished products is carried out as per AVDEL procedure.

PRODUCTION SCHEDULING (for rivets mfg.):

Manufacturing lead-time including outsourced processes has been established for each product. Production schedule is prepared so as to meet customer's delivery schedule. Stage wise production schedule is prepared & is displayed in the shop floor. Identification / product status of products at Incoming, In-process, finished stages are maintained by means of appropriate tags / labels. None of the customers is supplying tooling for manufacturing. Whenever any such instance takes place; relevant tool shall be permanently marked by customer's name. Preservation of products during Storage, Handling, and Packing & Dispatch shall be maintained so as to avoid product non-conformity during these operations.

STORAGE AND INVENTORY:

Extra Inventory cost is calculated on monthly basis. Whenever feasible, necessary actions are taken to reduce Inventory turnover ratio. For all material 'FIFO' system is followed. This is done by mentioning, 'Material receipt date' on identification tag. Yearly stock verification ensures quantities as per stock record and proper condition of materials. Any obsolete or deteriorated materials shall be treated as non-conforming. Rivets once supplied do not need any after sales service.

IMPROVEMENT:

Continual Improvement of Quality Management System effectiveness is ensured to, make the Organization more competitive. Continual Improvement are ensured through Management Reviews, Internal and External Audits, Data Analysis, Corrective Actions, Preventive Actions & Achievements of Quality Policy / Quality, Productivity Objectives. Continual Improvement of overall performance of organization is ensured by means of review of achievements of Quality Objectives, short term & long-term business goals & future opportunities for improvement. Actions are identified to improve the performance of Quality Management System. PDCA Cycle is followed to ensure systematic improvements.

- (PDCA = Plan-Do-Check-Act) Plan, Do, Check, Act (P-D-C-A) cycle for improvement is used.
- 8D approach is used for root cause identification & elimination.

- In case customer prescribed format for problem solving, same shall be used for reporting to customer.
- Necessary error proofing methods are used in manufacturing process design.
- Error – proofing methods as applicable are used in any corrective action initiated.

IMPROVEMENTS DONE AT AVDEL :

1. Various attribute gauges are introduced for In-process inspection for the ease of inspection & error proofing. This eliminated the errors in measurement.
2. Process validation study & revalidation study done for the Heat treatment (Annealing) process & set the annealing parameters like temp. & time as per the results of the study.
3. Application / Riveting test introduced after annealing, to ensure proper annealing before taking the shells for the next stage i.e. assembling.
4. Sensors are provided to the tracks of the assembly m/c so that the m/c automatically stops when product not coming from the track, eliminating the possibility of unassembled product.
5. Vibratory bowls are provided on the Assembly & crimping m/cs with Auto sorting adjustments for automatic sorting of defective pieces produced in forging stage.
6. At each stage quality of the product is checked after every 15 minutes for proper assembly & quality of riveting & is recorded after each hour.
7. To increase the capacity one PLOC control shell forging m/c is commissioned. It reduces the non-conformities also. Whenever non-conforming product produces m/c gets stopped automatically. So percentage rejection is also minimized.
8. One high-speed nail forging m/c is commissioned. Due to this, production capacity is increased as well as non-conformities due to wear & tear are reduced.

PACKING & PRESERVATION OF EQUIPMENTS, TOOLING, & GAUGES.

It ensures continuing suitability of m/cs / equipments / tooling & gauges when, not in use.

For Production Machines / Equipments:

- Whenever any machine / equipment is kept idle oil shall be applied on all moving parts.
- Daily lubrication of machine ensures proper working condition of machine / equipment.
- If any machine is lying idle for more than one month, machine capability shall be checked before starting production.

For Tooling :-

Whenever any tool is unloaded from machine grease should be applied on tool. Tools shall be stored properly so as to ensure Rust Prevention.

For Gauges :-

Whenever any instrument / gauge is not in use, oil shall be applied to all moving parts & slides. All instruments shall be kept in their own packing boxes so as to avoid unauthorized use & / or mishandling. Instruments / gauges should not be kept over any moving part of any machine.

PURCHASING

It is ensured that the conformance of purchased product to specified requirements w.r.to quality and delivery. Proper evaluation, selection of suppliers, issuing the purchase order and supplier's rating is also ensured.

This process is applicable to purchase of raw materials, such as Aluminum rod coils, M.S. Wire, tools, dies, punches, consumables. Including semi finished / finished products such as plating of nails, hand assembly / crimping, packaging material and any other material, which directly affects Product Quality.

Monitoring of suppliers are done on the basis of Quality Rating, Delivery schedule performance including premium freights incidences, Customer disruptions & / or field failures / returns due to supplier, Customer notifications of special status related to quality & delivery issues etc. Regulatory requirements applicable to products / services procured are reviewed with suppliers & it is ensured that these requirements are met.

INVITING QUOTATIONS :

The Supplier / Suppliers are communicated about the requirement and the verbal / written quotations are invited.

SELECTION OF A SUPPLIER :

(I) The purchase order is placed with one who offers acceptable commercial & technical terms.

(II) It is ensured that the supplier is selected from the acceptable list of suppliers.

(III) For selecting the supplier, who is not from the acceptable list proper justification is given by General Manager and the purchase order is prepared only after the verbal approval from the General Manager.

ISSUE OF THE PURCHASE ORDER:

1. The purchase orders are prepared for the selected supplier. The Purchase order shall contain required technical and commercial details to enable the supplier to supply right product / service and to enable inspection of product / service.
2. In case the selected supplier is not from the acceptable list of suppliers, the purchase order prepared is identified as "Trial Order".
3. The purchase order before issuing to supplier, is reviewed for adequacy of specifications with respect to technical and commercial aspects.
4. Before releasing the purchase order to the supplier, purchase order is authorized by G. M.

OUTSOURCING :

Material to be processed is sent out for processing and records are maintained in Job Work follow up Register. Whenever any such material is received back inspection is carried out as per relevant Inspection Plan. Records are maintained. Required technical specifications are informed to concerned suppliers on completion of subcontracting activity Q.A. person ensures that the necessary specifications are followed.

VERIFICATION OF PURCHASED PRODUCT :

No product supplied by supplier is accepted without verification by inspection department. If required, verification is done at supplier's premise by representative of Avdel (India) Pvt. Ltd. None of the Avdel's customer requires verification to be done at supplier's premises, as & when the need arises necessary arrangement shall be done. Quality of incoming products is monitored & ensured through:

- Receipt & Evaluation of statistical data
- Receiving Inspection & / or testing on sampling basis as defined in relevant Control plan.

- Yearly Supplier Quality System Audits, coupled with Supplier Quality & Delivery Rating.
- Outside Lab testing,

SUPPLIER RATING :

Quality Rating is done for 6 months of supplies as follows:

$$\text{Quality Rating \%} = \frac{\text{Accepted Quantity}}{\text{Supplied Quantity}} \times 100$$

Delivery Rating is also done once in 6 months as follows :

100 % - If delivery met in time,
75 % - If delivery delayed by max. 1 week,
50 % - If delivery delayed by more than 1week.

Supplier Rating = 0.8 (Quality Rating) + 0.2 (Delivery Rating).
Supplier Rating is categorized as: -

A ---------- ABOVE 90 % B ---------- 80 % to 90 %
C ---------- BELOW 80 %

In case of Supplier Quality Rating is below 90%, supplier will be informed verbally or in writing. As and when necessary list of acceptable suppliers is updated to include new suppliers / exclude poor performing suppliers – say " C " category. 'C' Category suppliers shall be informed for improvement in rating and this performance rating shall be monitored for one full year there after. If results are found not satisfactory for the next year, then the supplier may be considered for deletion if alternate source is available

For Hand Assembly, Crimping, & Sorting activities done by sub-contractors no supplier rating shall be done as these activities are carried out under strict supervision of Avdel's Supervisors.

PREPARTION OF LIST OF ACCEPTABLE SUPPLIERS :

List of acceptable suppliers is prepared. All suppliers are registered. New suppliers are selected based on Technical Capability and favorable commercial terms. Normally trial order is sent to new supplier based on discussions with supplier and reference given by supplier. Based on satisfactory result of trial order the supplier is included in the list of acceptable suppliers.

Key suppliers (subcontractors); whose performance may affect quality of rivets; are audited once in 6 months. Timely availability of right quality purchased products is output of this process.

CONTROL OF MONITORING & MEASURING DEVICES

Calibration of monitoring & measuring devices is done to ensure confidence in measurement and Quality of the product. The procedure is applicable to measuring devices used for Inspection and Testing of Incoming materials, In-process and Finished Products. Monitoring & measuring devices are selected depending upon the specified parameters to be checked & its accuracy and precision.

All monitoring & measuring devices are identified and listed for which periodic calibration or verification is required. Frequency of calibration or verification or inspection of devices is decided based on past experience. Monitoring & measuring devices are used / deployed in such a way that least count is 10 to 20 % of required tolerance. Required Accuracy (permissible error) are equal to or less than least count. Monitoring & measuring devices are calibrated with devices that are traceable to Indian or International standard. Where Indian or International standard is not available, the calibration procedure is identified and documented. Work Instructions are developed for In-house Calibration of each measuring device including details of equipment type, unique identification, location, frequency of checks, check method, acceptance criteria and the action to be taken when results are unsatisfactory. Calibration status of monitoring & measuring devices are put on it. Calibration records are maintained for all monitoring & measuring devices and are stored in file. Calibration records include :

- Master Instrument used for Calibration
- Observations during Calibration.
- NPL Traceability
- Engineering changes if any etc.

When monitoring & measuring devices is found to be out of calibration, then previous inspection results are assessed. If required, Production Department is intimated and products are re-inspected. All monitoring & measuring devices are handled carefully, to safeguard it from mishandling and invalid adjustments of calibration settings. Calibrated monitoring & measuring devices ready for use & maintained in proper condition is the output of this process.

INSPECTION & TESTING

It is ensured that the products are inspected and tested from receiving to finished product so that the products meet specified requirements, and proper records of inspection & testing are maintained.

It is applicable to all products at Incoming stage, In-process Inspection stage, & Final Inspection stage.

Works manager & Production Manager are overall responsible for supervision of Inspection and Testing activities. Supervisor is responsible for Inspection & Testing at Incoming, In-process & Final stage & maintaining records at Incoming In-process & Final stage. Operators are responsible for Inspection & Testing during process & records results in formats.

Receiving Inspection & Testing :

Inspection is done as per Control plan. Inspection supervisor receives challans stamped on its backside as ' Inspection-cum Goods Receiving Report' from stores. Raw-materials such as Aluminum Rod coils received with Test Certificates and certificates are filed date wise after reviewing suitability of RM. Dimensional aspects of the materials are checked for parameters like O.D. of the rod at 3 places on each coil and total weight of the materials. Sample is identified at vendor's end then cut and tested, based on the results only the Lot (Coil) is accepted brought to factory. Incoming raw materials Mild steel wire and processed Aluminum wire, in coil form are inspected / tested and recorded for the parameters such as wire dia. Weight & breaking load.

Semi finished product such as plated nails (mandrels/stem) are checked visually & by bending to ensure plating does not flake. In case of non-conforming product are recorded in Inspection cum Goods Receiving Report. Incoming finished products such as assembly of shell & nail and crimping of the assembled Blind Rivets are inspected as per gauge & tested for application test and are recorded. Bought-out items such as tools & spares & packing are checked as per Purchase Order specifications or as per drawings as applicable.

IN PROCESS INSPECTION (SHELL) :

Inspection / Testing are done as per Control Plan & drawing by means of attribute gauges. At Cold Forging stage Shell are inspected for the parameters mentioned in the drawing, and are recorded hourly by operator. Before starting the production the job is offered for inspection. If parts conform the specification operator is allowed to carry out production. In case of non-conformance, operator is asked to correct the deviation and submit fresh sample. If fresh sample is found conforming to the specification, supervisor / inspector allows the machine to run & reading is recorded. During production inspection is carried out. Degreasing of shell is checked visually to ensure Shells are free from excess oil. After annealing of shells, shells are inspected for its function, by application test i.e. by putting nail into shell and riveting it with riveting tools & Riveting is compared with the

sketch. Parameters such as cycle times, temperature, and result of application test are recorded. Polishing is done in vibratory bowl, checked visually, and dried in Mini Drier. OK products (shells) are identified with tally and be forwarded for assembly.

IN PROCESS INSPECTION (NAIL) :

Inspection / Testing are done as per Control Plan & drawing by means of attribute gauges. At Cold Forging stage Nail are inspected for the parameters mentioned in the drawing, and are recorded hourly by operator. and if confirming to specification are offered for inspection. Inspection supervisor inspects offered piece and if it is confirming to the specification, inspection supervisor allows machine to run and inspection results are recorded. In case of non-confirmation operator is asked to correct the deviation and submit fresh samples. If fresh sample found confirming the specification inspection supervisor allows the machine to run. During the production, Inspection is carried out. OK product (Nails) are identified with tally and be forwarded for next stage of operation.

IN PROCESS INSPECTION (ASSEMBLY) :

OK shells and OK nails are assembled and assembly are inspected and tested for gap (visually or by Gauge) and shall not be recorded. Projected length is checked and recorded. Assembly (In-house) is checked for fitment for the gauge and results are recorded in format. During the Production, Inspection is carried out as per Work Instruction.

CRIMPING :

Inspection and testing is done for the parameters as indicated in Work Instruction and results are recorded. Hand Assembly, Crimping & Sorting done by vendors is inspected as per the Parameters of Final Inspections. For checking of Gap (Visually or by Gauge) minimum 50 samples are checked per gunny bag. OK products are forwarded for Final Inspection.

Final Inspection / testing are done as per Inspection Plan and / or documented procedure:

QA Engineer collects 5 products per gunny bags and check for parameters and Inspection result for 5 nos. are recorded. In case, product is reworked at any stage re-inspection is carried out and is recorded. In case of rework involved only for Gap fittings, the batch no. remain unchanged however re-inspection report for all other parameters will be maintained only if Quantity exceeds 10 kgs.

PRE DISPATCH INSPECTION:

Depending upon customers requirements of pre-dispatch inspection report, Deputy Manager Planning forwards pre dispatch inspection indicating Purchase order No. and date , Parties Name ,delivery challan No. and date and total Quantity to be dispatched along with 5 nos. samples of rivets to Inspection . In turn Inspection Supervisor will carry out detail Inspection and return the duly completed form to Deputy Manager - Planning.

INSPECTION AND TEST RECORDS:

Records of above mentioned Inspection and Testing activities are kept. Records of test certificates received from outside testing laboratories and Sub-contractors are kept. Inspection reports indicate authority for acceptance or rejection of products. Functional testing includes RM testing, shell / assembly application test. These are carried out at relevant stages of product realization as identified in Control Plan.

LAYOUT INSPECTION & FUNCTIONAL TESTING FOR RIVETS:

Layout inspection ensures conformance of product with respect to all dimensional requirements as expressed in product drawing. Functional Testing ensures performance of the product with respect to customer expectation e.g. Load carrying test.

- Applicable layout inspection & functional testing requirements are identified in control plan.
- Results of layout inspection & functional testing are made available to customer whenever required.

Production details are recorded by the production supervisor in Daily production format given below. :

DAILY PRODUCTION REPORT

DATE : SHIFT :

sr no	Machine	Name of Operator	Part No.	Prod. Kgs.	Prod. Nos.	Remarks
1.	HEADER D					
2	HEADER B					

3.	HEADER A					
4.	NAIL-P (NEW)					
5.	NAIL- R (NEW)					
6.	D-ASSEMBLY					
7.	P-ASSEMBLY					
8	CRIMPING					
9	OLD - A/A					
10	NEW - A/A					

ANALYSIS OF DATA

Data indicating level of customer satisfaction is tabulated. Wherever level of customer satisfaction is below benchmark or found to be lower, reasons for the same are analyzed & actions are decided. Trends in % rejection & % rework are analyzed. Where necessary, action plans to control the rejections / rework with responsibilities & targets are defined. Selected suppliers are evaluated on the basis of quality & delivery to ensure continuing suitability. Performance of selected business processes is analyzed through Quality Objectives / Productivity Objectives. Results of analysis are compiled every 6 months to judge effectiveness. These results are communicated to concerned personnel (including suppliers) who are responsible to initiate action or maintain existing level of performance. Achievements in Quality Objective targets are reviewed through trends in company level data, such data are compared with competitors' information & benchmarking.

CONTROL OF NON-CONFORMING PRODUCT

It is ensured that non-conforming products are identified, documented, evaluated segregated and disposed so that it is prevented from unintended use. This is applicable

to raw materials from vendors, in-processed, & finished products, products lying in stores, & customer returns.

Stage	Responsibility for Identifying Non-conformity	Disposition Authority
Incoming stage	Supervisor	Works Manager
In-Process	Supervisor & Operator	Works Manager
Finished stage	Supervisor	Works Manager
Storage	Stores - Supervisor	Works Manager
Customer return	Stores - Supervisor	Works Manager

If product is not conforming to the specification it is considered N/C products. Normally N/Cs observed in production are due to:

a) Personal errors,

b) Error due to supplier.

N/C is analyzed for finding the root cause. Incoming inspection QA In-charge identifies N/C at Incoming Inspection stage. N/C is recorded. N/C products are kept in separate with “HOLD” tag, mentioning Item name, item no., name of supplier, qty, challan no. In case of N/C product it shall be sent to vendor. N/C products identified at crimping stage & final inspection stage are sorted out and recorded in register for non-conforming products. OK products are forwarded for Final Inspection. N/C products at this stage are kept separately with “HOLD” tag. In case, N/C product are observed at final / pre-dispatch stage it is recorded in register and are kept at separate place. N/C product can be subcontracted for categories sorting, repair / rework & scrap. Reworked products are re inspected & are recorded. Store in charge store N/C products in designated area. If N/C product is due to processed at supplier’s end, supplier is asked to re-process or replace the product. If it is due to long storage or improper preservation appropriate action is taken. If product cannot be used, monthly scrap report is prepared. Customer return is kept in separate area and recorded. In case any product non-conformity becomes apparent after dispatch same is intimated to customer, if required. Disposition of such products is planned so as to ensure that end-use of the product is not affected because of non-conformity.

Works Manager is responsible for disposition of N/C product at In-process, Finished stage, Incoming, storage & customer returns. Monthly summary report of N/C products is prepared & is put to Management Review Committee. Records of all above actions & necessary references are kept. PPM level of each workstation is monitored based on non-conformances at the station or at subsequent station or at customer’s end. Records are maintained. Cost of Poor Quality is calculated at organizational level.

Effectiveness is monitored through trends in PPM & COPQ on monthly basis, using line graph.

CORRECTIVE ACTION (to avoid re-occurrence of non-conformity):

It eliminates the causes of present non-conformities in product, process, system. This is to prevent recurrence of non-conformities. This is applicable to the non-conformities related to product, process or system, involving all areas affecting quality / productivity aspects.

PLAN

Non-conformities in product, process & system including customer complaints are reviewed. Root cause of the non-conformity is decided by analyzing all probable causes. Need for action to ensure that non-conformities do not recur; are evaluated. Action plan for eradicating the root cause is decided along with target schedule & responsibility for same. Necessary resources for action plan completion are provided. Action plan decided is recorded.

DO.

Decided action plan is executed. It is ensured that the action plan is completed within stipulated time frame. Completion status is recorded.

CHECK

Implemented action plan is reviewed for its effectiveness & improvement due to action is ensured. Further opportunities for improvements. Analysis remarks are recorded.

ACT

Similar products & / or processes, where similar actions can be implemented; are identified. Necessary changes in processes &/ or documents are initiated to prevent recurrence.

PREVENTIVE ACTION (to avoid occurrence of non-conformity):

Preventive actions are initiated to prevent occurrence of potential non-conformities or for further refinement / improvement of QMS effectiveness. This is applicable to the non-conformities related to product, process or system, involving all areas affecting quality / productivity aspects & manufacturing process improvement.

PLAN

Potential non-conformities in product, process & system are determined. Root cause of the potential non-conformity is decided by analyzing all probable causes. Need for action to prevent occurrence of non-conformities is decided. Action plan for eradicating the root cause is decided along with target schedule & responsibility for it. Necessary resources for action plan completion are provided. Action plan decided is recorded

DO

Decided action plan is executed. It is ensured that the action plan is completed within stipulated time frame. Completion status is recorded.

CHECK

Implemented action plan is reviewed for its effectiveness & improvement due to action is ensured. Further opportunities for improvements, are identified. Analysis remarks is recorded

ACT

Similar products & / or processes, where similar actions can be implemented; are identified. Necessary changes in processes & / or documents are initiated to prevent occurrence of potential non-conformities.

PRODUCT IDENTIFICATION & TRACEABILITY, INSPECTION & TEST STATUS.

Identification: - The identification of material /products for correct usage & to prevent mixing of products is ensured.

Inspection & Test Status:- It is also ensured that the accepted material / products are used, processed, packed or dispatched and the rejected material / products are prevented from getting mixed with the accepted products.

It is applicable for identification of accepted & rejected materials from receiving stage through complete production stage up to delivery stage.

For identification in stores : Stores supervisor

For identification in shop floor : Supervisor Production

For finished products in packing & Finished Goods Store:

Dy. Manager Planning

For identifying Inspection & Test Status :

At receiving Stage	:	Supervisor
At In-process Stage	:	Supervisor
At final Stage	:	Supervisor

PRODUCT IDENTIFICATION / INSPECTION & TEST STATUS.

- On receipt of material at stores it is identified by vendor's tag
- After verifying the material with vendor's tag and challan details, it is identified with Blue Tag.
- On inspection OK material is handed over to stores by QA with Accepted tag & rejected material is identified by red. And is stored in respective designated area. Aluminum & Steel wire coils that are received after sample testing only are directly identified with Green colour Tag and after in house re-inspection the same are stamped with accepted stamp.
- Rejected product shall be segregated from accepted product or stored separately in designated area.
- The products for which decision is pending is identified by "HOLD" tag giving description & remarks from inspection if any. These products are segregated as decided.
- In-process material at various stages of process is identified with yellow tag.
- Product awaiting for reprocessing at any stage of process is identified with white tag.
- In-process material (Shell, Nail & Assembly) is also be identified with Rout Card & tally card for its batch distribution. In addition to this card any material, which is awaiting decision, is identified with additional tally card as "HOLD". Scrapped material is identified by red tally / red container. Shells and Assembled Rivets manufactured from NR4 material are stored in Blue container & from NR5 in Green container.
- At final inspection & testing the accepted product is identified as accepted tag with tally card mentioning "ACCEPTED" & rejected product is identified as "REJECTED".
- The customer returned product is identified by designated area.
- Identification at final packing stage is covered in Storage procedure.

Summary of tags:

Sr. no.	TAG TYPE	TAG NO.	COLOUR	USED FOR
1	Material Received	T08QA01	Blue	Receipt of Material at stores.
2	Accepted	T08QA02	Green	Accepted Material
3	Rejected	T08QA03	Red	Rejected material At any stage.
4.	Hold	T08QA04	Pink	Incoming, In-process stage & final stage.
5.	In Process	T08QA05	Yellow	Under process at Various stages.
6.	Reprocess	T08QA05-A	White	Waiting for Reprocess.

TRACEABILITY:-

On receipt of raw material entry of RM details is made in GRN. Route card for each batch of Shell / Nail / Assembly in process is maintained. Prior to assembly batch no. of shell & Nail issued is recorded in assembly Batch no. Register. The register also contains Assembly Batch No. During crimping stage, Assembly Batch No. is recorded in for in-house crimping on m/c and for hand crimping done by suppliers, it is recorded in Job-work Follow Up Register. Assembly route card is prepared for each Assembly batch.

Packing box – Batch No.

Batch no. derived from last operation carried out prior to final inspection is mentioned on the packing box. Against one Batch Number (Route Card) if the products are kept in more than one container tally will be provided in each container.

- Effectiveness is monitored during internal audits ensuring proper identification of lots.
- Final product audits carried out every 6 months, also indicate effectiveness.

APQP (ADVANCED PRODUCT QUALITY PLANNING)

AVDEL covers the steps to be taken for preparing APQP (Advanced Product Quality Planning) for New Product Development. This is applicable to all Development & Revisions in existing products. HOD - QA With the help of team members is responsible for the Documentation and Implementation of APQP activities. This activity of APQP is carried out with reference to the guidelines and steps given in the APQP and CONTROL PLAN Manual for inputs, outputs and controls for different phases.

After receiving enquiry for Development of New Product, immediately following actions are to be initiated:-

- A multidisciplinary team generally comprising of personnel from QA and manufacturing are to be formed. One team leader is to be nominated.
- The team should define the scope considering customer needs, expectations & requirements.

In the first phase of plan & define program following outputs are generated.

- Defining customer requirements specific to product performance,
- Preliminary process flowcharts (up to component level),
- Preliminary listing of Special Product & Process characteristics,
- Feasibility report for New Product Development,
- Initial risk evaluation if the product requires new type of technology / substantial investment.
- New equipment, tooling, and facilities requirements are reviewed as per new equipment tooling and test equipment checklist.
- Special product and process characteristics are documented.
- Gauges / testing equipment requirements, if any are reviewed.
- Team Feasibility Commitment Report is signed by all team members, once Feasibility of Product Manufacturing is ensured.

In the third phase of Process Design and Development, the inputs from the second phase are to be taken in order to generate the following outputs: -

- Packing standards if specified by customer and different from existing packing.
- Product / Process Quality System review for which the Product / Process Quality checklist is to be used.
- Process Flow- Chart if being different from existing for which the Process Flow-Chart checklist is to be used.
- Floor plan layout if existing Floor plan needs some modification for manufacturing, new part family or new type of machine / equipment is to be made available for which the Floor Plan Checklist is to be used.
- If new PFMEA is to be prepared or existing PFMEA needs revision for New Product Development, for which the process FMEA Checklist is to be used.
- If any new process is to be developed or products specific care is to be taken during manufacturing.
- Measurement System Analysis Plan if new Measurement System is to be used.

- Preliminary Process Capability study.
- Unit In-charge reviews all above-mentioned activities to ensure management support.

In the fourth phase of Product and Process Validation, the inputs from the third phase is taken in order to generate following outputs : -

- Production trials run.
- Measurement System Evaluation, if New Non – Evaluated Measurement System is involved.
- Preliminary Process Capability Study.
- Production Part Approval.
- Sample Performance Test if required.
- Packing Evaluation, if new packing is to be used.
- Quality Planning sign- off and management support for which Product Quality Planning Summary and sign-off is used.
- Manufacturing process conformance for which Process sign-off checklist is used.

In the fifth phase of Feedback, Assessment and Corrective Action, the inputs from the fourth phase are to be taken in order to generate the following output: -

- Reduced variation through appropriate SQC tools to demonstrate stable process.
- Customer satisfaction through approvals from customers & regular supplies.
- Part history is maintained.

The progress of APQP is reviewed in the management review meeting & it is updated in APQP time schedule & progress review. Product & Manufacturing Processes are Validated with respect to Customer Requirements. Ability of Mfg. Processes & Products developed to meet customer requirements with minimized changes & timely completion of scheduled activities.

Handling, Storage, Preservation, Packing & Delivery:

It provides safe handling, providing storage areas and preservation to prevent damage of product and to ensure safe packaging of product such that the product is delivered to customer without any damage or deterioration during transportation. It covers all the items required for the manufacturing of products and critical spares for maintenance of Machinery / Equipment. Store – Supervisor is responsible for

implementing Handling, Storage & Preservation. Dy. Manager- Planning is responsible for Packing & Delivery.

HANDLING

Handling is done manually or by trolley and is safe in respect of material & persons.

STORAGE:

Material is in warded after verifying the challan and is recorded in Inward Register. Verified challans of vendors are stamped with Inspection Cum Goods Receiving Report and forwarded to Quality Assurance. Stores Supervisor receives Inspection Report for incoming & processed raw materials, Inspection Report for tools, spares & bought out items & Inspection Report for in-house / Incoming finished product, (Assembled & Crimped Rivets). Rejected goods are separated and stored in designated area. Accepted goods stored as per guidelines provided. Material is issued as per production requirement and stocks are recorded in issue requisition slip. Material receipt & issue is authorized by stores supervisor & shift in-charge. Stock card is maintained by description of date, reference, issue, & balance quantity. Stock verification is done ½ yearly against stock card. Any discrepancy in physical stock of stock card, quantity is corrected. Material requirements are informed to Works Manager verbally as and when required or by Purchase Requisition Slip. The Verbal requirements are recorded in Purchase Order Booking Register. Store provides storage area for storing material. All accepted materials stored in the area allocated as per the guidelines provided.

Guidelines for storage of materials:

Sr no.	**Material**	**Method of storage**	**Storage**
1.	Aluminum Wire:	On Floor	One upon one(vertical row)
2.	Steel Wire .	On Floor	Side by side (Horizontal row)
3.	Tools	In cupboard bins	Segregated & labeled kept in bins
4.	Accessories	In bins	Segregated & labeled kept in bins
5.	Spares	In cupboard racks	Segregated & labeled kept in cupboard bins

6.	Drills	In bins	Bins & Plastic bags with labeled
7.	Ball bearings	In bins	Bins & cupboard Drawer
8.	Finished Goods	In boxes	Carton box packed with sticker of each sizes in the racks in FGS.
9.	Machine parts	In racks & bins	Cupboard racks with labeled attached

'FIFO' System is followed for item in store- condition of material in stock is verified at least once in a year. Cost of excess inventory is monitored.

PRESERVATION:

M.S. wire is received & is consumed in short span hence no anti-rust oil is used. Preservation is not applicable to our products. Electro-plating of Nails is done prior to assembly to avoid rusting.

PACKAGING:

The Quality of packaging material is assessed during incoming inspection and only the packaging material. Conforming to the specifications is used for packing of the finished products. The packing of the finished products shall be done as per Work Instruction & chart is referred. Packing details are entered in Finished Goods Product Packing Record Register. Stickers "AVEX BLIND RIVETS" mentioning Part No., Quantity, Dia., Grip Range & Drill size including Tel. No. & Fax No. of AVDEL (India) Pvt. Ltd. are stickled on small carton (corrugated box). In big carton (case) in which small carton are placed for dispatch contain bigger sticker containing booking instructions "DIRECT / SELF", Destination, Part No., Quantity & Case No. In case of "DIRECT" Delivery, Name & Address of customer will be mentioned.

DELIVERY :-

As per Order Confirmation, Dy. Manager Planning fill dispatch authorization form & get clearance from accounts department & after getting clearance makes the entry in dispatch register & shall maintain dispatch authorization form in file along with copy of invoice, challan, LR & covering letter. Invoice & Challans are prepared as per Dispatch Authorization Form. Dy. Manager Planning arrange for delivery depending upon ex-factory, local or for outstation. Challan, Invoice (gate pass) forwarded along with every consignment. For out station Dy. Manager Planning provides delivery sticker containing

booking instructions, destination, part no., case no. & quantity. Dy. Manager Planning forwards goods forwarding note along with challan, invoice (gate pass) & arrange transportation. Premium Freights due to delay are monitored on monthly basis.

Properly stored / maintained RM / In-process & / or finished products is output of Handling Storage, Preservation & Packing Process. Packed products dispatched from factory are output of delivery process.

- Effectiveness of Handling Storage, Preservation and Packing Process is monitored through yearly physical stock verification.
- Effectiveness of delivery process is monitored through percentage (%) On-time Delivery & Premium Freight paid on monthly basis.
- Effectiveness of Stock rotation & Inventory Control is monitored on the basis of Extra Inventory Cost per month.

HANDLING OF CUSTOMER COMPLAINTS :

It ensures proper and systematic action is taken for the customer complaints received. On receipt of customer complaint, it is documented in customer complaint record by Marketing Department / Deputy Manager Planning.

Customer complaint if it is commercial is handled by Sr. Manager customer services / Dy. Manager planning-complaints pertaining to rates, delivery schedule, excise duty, sales tax, modvat etc. are considered as commercial complaints.

Customer complaint format shall contain date of complaint received, customer, location, nature of complaint, complaint reference & detail, corrective action, root cause finding, planned corrective/ preventive actions completed, information to customer, customer feedback, as applicable. Marketing forwards Technical complaints to G. M. for necessary action. Customer complaints (Technical) are analyzed for reasons for rejections corrective action is initiated and informed to the customer.

Effectiveness of this process is monitored through trends in no. of complaints & returns on quarterly basis. It is ensured that repetitive complaints are avoided. Time required for resolution of complaint / analysis of rejected product indicates efficiency of the process.

MONITORING, MEASUREMENT & ANALYSIS OF CUSTOMER SATISFACTION:

It judges level of customer satisfaction & to identify opportunities for improvement of current level of customer satisfaction. Customer satisfaction surveys: -

- Customer satisfaction survey forms are sent to all customers at least once in a year.
- Feedback received through survey analyzed to review areas of satisfaction / dissatisfaction.
- In whichever aspects customers are found to be dissatisfied, reasons for dissatisfaction are identified & actions to resolve the problems are decided accordingly.

Delivery performance to customers is monitored on monthly basis. Whenever delivery performance is found to be lowered; root-cause for the same are identified and appropriate actions are initiated. Level of customer satisfaction is also be determined based on inquiry to order success ratio on quarterly basis. Level of customer satisfaction is judged based on sales trend on yearly basis, no. of new customers added every year & no. of repeat customers. Trends in customer complaints also indicate success in reducing customer dissatisfaction. This analysis is done on quarterly basis. Whenever required relevant departments are involved in implementing actions to improve customer satisfaction. Internal Review of customer satisfaction are done on the basis of :

- Internal / External PPM level.
- Delivery Performance.
- Customer Returns / Disruptions.
- Customer Audit Reports.
- Improvement in productivity.
- Improvement in Process Capability etc.

CUSTOMER SATISFACTION:

Monitoring & measurement of customer satisfaction are ensured. Monitoring compliance with customer requirements Quality, Quantity & Delivery Requirements) at Avdel are organized. Complaints / Feedback received from customer are analyzed and necessary actions initiated.

LIMITATIONS:

Company's technical secrecy cannot be disclosed in this report.

CONCLUSION:

Thus Production planning is the key activity for the Organization's efficiency, effectiveness, timely delivery, Quality product, and Customer satisfaction. This is just like the steering wheel of running vehicle, which drives you to destination.

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