SUPPLY CHAIN-LOGISTICS, PACKAGING, SUPPLY CHAIN AND THE ENVIRONMENT

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- SUPPLY CHAIN-LOGISTICS, PACKAGING, SUPPLY CHAIN AND THE ENVIRONMENT
- ISO 14000/210
- DESIGN FOR PEOPLE – ERGONOMICS, REPAIRABILITY, MAINTAINABILITY, SAFETY AND PRODUCT LIABILITY
- TASK ANALYSIS
- FAILURE MODE ANALYSIS

IMPORTANT DEFINITIONS

SUPPLY CHAIN

Complete flow of the product and includes all of the companies with a collective interest in a product's success, from suppliers to manufacturers to distributors.

- **It includes vendors, and their suppliers, manufacturing, sales, customers, repair, customer service, and disposal.**
- **It includes all information flow, processes and transactions with vendors and customers.**
- **Today's business climate is concerned more with developing equity relationships and forming joint ventures around the success of the entire supply chain rather than an individual company's gains or losses.**
- **A key to success is for everyone on the supply chain to have the latest and best information from everyone else.**

LOGISTICS

Discipline that reduces life cycle installation and support costs by planning and controlling the flow and storage of material, parts, products, and information from conception to disposal.

ENVIRONMENTAL DESIGN

Goal is to minimize a product's effect and cost on all aspects of the environment.

- Design goals include reuse, recycling, remanufacturability, disassembly, ease of disposal, use of recycled materials, using environmentally friendly manufacturing processes and selecting vendors with good environmental histories.
- Short-term environmental discussions include compliance to regulations and laws; whereas long-term decisions include environmental liability and anticipation of global environmental concerns.

BEST PRACTICES FOR SUPPLY CHAIN, PACKAGING, AND ENVIRONMENT

(i) Supply chain and environmental considerations are part of all trade-off analysis and incorporated early into the design of the product, it's manufacturing processes, packaging, vendor selection and other product related items.

(ii) Design methods include:

- **Design For Supply Chain and Logistics**
- **Customer Service and Maintenance**
- **Design For Disassembly (DFD)**
- **Packaging Design**
- **Design For The Environment (DFE)**
- **IS0 14000**

TEST AND EVALUATION

IMPORTANT DEFINITIONS

DEVELOPMENTAL TEST AND EVALUATION

An integrated series of evaluations leading to the common goal of design improvement and qualification.

- All reviews and tests are organized to improve the product.
- All identified problems and detected failures result in analysis and corrective action.
- A planned program requires that all available test data be reported in a consistent format and analyzed to determine reliability growth and the level of technical risk.

VALIDATION

Process of insuring that the design meets the customer's expectations.

- The level of verification is directly related to how well the requirement definition phase was performed. Using prototypes, the testing starts in the earliest phases of requirements definition, conceptual design and detailed design.

BEST PRACTICES FOR TEST AND EVALUATION

The goal of every test and evaluation method is to identify areas for design improvement. The key practices are:

- Test and evaluation strategy effectively coordinates all tests to verify a design's maturity in a cost-effective manner.
- Design reviews use a multidisciplinary approach for evaluating and improving all parameters of a design including producibility, reliability, and other support areas.
- Prototyping, design modeling and simulation are used to both validate and verify the design, identify problems and solicit ideas for improvement.
- Design for test is used to design the product for easy and effective test.
- A test, analyze, and fix methodology is used to identify areas for design improvement to maximize the reliability growth process.

- Software test and evaluation uses proven methodologies to ensure effective verification and identify areas for improvement.
- Environmental, accelerated life, and HALT testing of critical components is initiated early in the program.
- Qualifying new parts, technologies, and vendors are started early and used for improving the product and reducing technical risk.
- Production testing considers all quality control tests including incoming testing and environmental stress testing.

MANUFACTURING: STRATEGIES, PLANNING AND METHODOLOGIES

IMPORTANT DEFINITIONS

MANUFACTURING STRATEGIES

Vision and framework for accomplishing long-term corporate goals.

- Helps to focus manufacturing goals and provides plans for integrating the necessary functions and resources into a coordinated effort to improve production.

MANUFACTURING PLANNING

Roadmap that identifies the approach and tasks for all critical paths between design, production, and the tasks necessary to ensure a successful transition from design to manufacturing.

- Heart of the front-end production effort and the road map for the establishment of all production specifications.
- As the design develops, the comprehensiveness and thoroughness of the plan will increase.

PRODUCIBILITY

Discipline directed toward achieving design requirements that are compatible with the capabilities and realities of manufacturing. More specifically, producibility is a measure of the relative ease of manufacturing a product in terms of cost, quality, lead-time, and technical risk.

Design for producibility is often called by other names, including manufacturability, design for manufacturing, design for automation, design for robotics, and design for production. Regardless of the terms used, designing for producibility is the philosophy of designing a product so that it can be produced in an extremely efficient and quick manner with the highest levels of quality.

This is accomplished through an awareness of how design decisions affect the production process, including the capabilities and limitations of specific production equipment.

MANUFACTURING STRATEGIES

Vision and framework for accomplishing long-term corporate goals. The vision establishes the company's goals for manufacturing. The framework helps to focus efforts on meeting manufacturing goals by planning for integrating the necessary functions and resources into a coordinated effort.

- Communication of this strategy sets the right climate for the teamwork and long-term planning that are necessary to improve manufacturing capabilities.
- The strategy should be well known throughout the company, with regularly scheduled reviews to monitor progress toward the goals.
- Long range strategic plans allow sufficient emphasis to be placed on identifying and anticipating manufacturing technologies of the future. In this manner, manufacturing is prepared for new technologies with the expertise and equipment early enough to stay ahead of competitors.

A manufacturing strategy addresses the following concerns:

- Are future manufacturing technologies and requirements identified and essential expertise acquired in development efforts?
- Is the manufacturing strategy compatible with long-range corporate objectives and factory modernization initiatives?
- Is there a long-term commitment for continuously improving Manufacturing and vendor capability?
- Do the manufacturing, vendors and design functions interactively develop both product and manufacturing process designs?
- Are important vendors identified and long term partnerships established?
- Are the "make or buy" decision criteria/parameters for outsourcing established for determining whether to outsource or manufacture within the company?

MANUFACTURING PLANNING

Coordinates the various production planning elements, such as production readiness and qualification.

- Without the benefit of thorough manufacturing planning, major problems will occur when a product is first produced.
- The manufacturing plan identifies the approach and details all tasks necessary for accomplishing manufacturing's strategies. This includes all critical paths between design and production and the tasks necessary to assure a successful transition from design to manufacturing.
- Manufacturing plan continues in effect throughout an entire program. Although no standard plan exists that is adequate for all products, all manufacturing plans are concerned with meeting the cost, schedule, quality, performance, and environmental goals established for the product.

The outline of the manufacturing planning are,

1. Product definition and requirements planning:
   (i) Product requirements and configuration
   (ii) Procured technologies and vendors
2. Product schedule and quantities:
   (i) Product development and release schedule
   (ii) Production schedule and quantities
3. Product procurement and supply chain approach:
   (i) Design guidelines and standards
   (ii) Make parts in house or buy from vendors
   (iii) Vendor benchmarking and selection
   (iv)New technologies/vendors/services required and qualification plan
   (v) Quality control
   (vi) Supply chain requirements for shipping, packaging, and environmental issues

4. Manufacturing processes and prototypes:
   (i) Processes required and capabilities (precision and quality)
   (ii) Qualification plan including prototypes
5. Manufacturing functional plan:
   (i) Product cost (breakdown)
   (ii) Processes and equipment utilized
   (iii) New process development
   (iv) Make or buy criteria and decisions
   (v) Methods, training, skills required
   (vi) Manufacturing capacity and facilities
6. Test functional plan:
   Comprehensive test plan

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Thank you