WORLD CLASS MANUFACTURING

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World Class Manufacturing

- Everyday the markets are becoming global
- Businesses and operations accordingly are becoming more global
- A **traditional** company organised with separate division for each country in which the company operated
  - Company at a competitive disadvantage because of inadequate products, wrong scale of operations and wrong way of marketing

World Class Manufacturing

- A **multinational** corporation is a firm that has extensive involvement in international businesses in more than one country
- A **global** company is a firm that integrates operations from different countries and views the world as a single market place
- A **transnational** company is a firm that seeks to combine the benefits of global scale efficiencies with the benefits of local responsiveness

World Class Manufacturing

- Objectives of Global production /operation
  - Reduce costs (labour, taxes, tariffs etc)
  - Reduce risks (foreign exchange)
  - Improve supply chain
  - Provide better goods and services
  - Attract new markets
  - Learn to improve operations
  - Attract and retain global talent

WORLD CLASS MANUFACTURING

- The recognition of an organisation as a bench mark by its industry sector and, for some aspects, by other industry sectors
- World Class Manufacturing Organisations consistently deliver exceptional performance, frequently in excess of expectations

WORLD CLASS MANUFACTURING

- Criteria for judging whether a company is world class manufacturing company
  - How does the company compare with its best competitors?
  - Has the company increased its score on the check list since last year?

Requirements of Excellence

- Excellence requires genuine improvement or advancement in some of the dimensions of performance without slipping
- Dimensions of performances for excellence
  - External quality
    - Value adding performance for customers not only meeting their expectations but exceeding these
      - Measured through repeat sales, warranty return rates, complaints, etc.

Requirements of Excellence

- Internal quality
  - Defect free processes measured as yields, defect rates, error rates etc
- Dependability
  - Never failing to make good on promises in production, measured as on- time delivery to customers, on-time arrival from suppliers etc
- Resources use
  - Eliminating waste and non-value adding activities measures as labour productivity rates, output rates

Requirements of Excellence

- Flexibility
  - Ability to change quickly and to respond to customer quickly (agility) measured as concept- to-customer time to bring out a new product, order lead times etc.
- Human Resources Improvement
  - People , employees as well as from suppliers, and customers, are the most important and valuable assets measured as training time given to customers

Requirements of Excellence

- Innovation
  - Always advancing in the application of products and process technology without waste
- Environmental soundness
  - Operations carried out without damage to the environment measured as environmental pollution emission from manufacturing
- Financial results
  - Sustaining a rate of return favourable to all financial stakeholders

World Class Suppliers

- Supply- chain management viewed as key element by world class manufacturers
- Key considerations for choosing suppliers
  - Quality of product or services,
  - On time delivery,
  - Flexibility,location
  - Price
  - Product or service changes

World Class Suppliers

  - Reputation, and
  - Financial stability
- Suppliers or vendors chosen, evaluated periodically based on factors like price, quality, delivery time etc.

Strategies Adopted by World Class Manufacturers

- Areas relevant to achieve the competitive advantage in production and operations management
  - Developing Manufacturing/ Operations strategy
  - Effective Forecasting in Operations Management
  - High quality Designing and Developing Products and Production Process
  - Outstanding Long-Range Capacity Planning and Flexibility in Facility Location/layouts

Strategies Adopted by World Class Manufacturers

- Realistic Aggregate Planning and Master Production Schedule
- Real time customer Demand & Inventory Systems
- Resource – Requirement Planning adopting MRP, CRP, MRP II and ERP systems
- Shop floor Planning and Control in Manufacturing using computer programmes like SAP-R/3, Macola, Order Links etc
- Advanced Planning and Scheduling Service Operations approaches

Strategies Adopted by World Class Manufacturers

- Adopting Just-in-time Manufacturing techniques
- Efficient Supply-chain Management
- Implementation of proven Productivity, Teamwork and Empowerment techniques
- Strong commitment to Total Quality Management & Total Productive Maintenance by top management

Check points for world class company

- Delivering to customers on-time-in-full, more than 90% of the time, against delivery commitments
- Knowledge to the employees about the key customers of the company and about the strengths of its products over the product & services from the competitors
- Authority and empowerment to staff in contact with customers to resolve their problems
- Supply chain controlled by Kanbans
  - Kanbans in modern days are fax, card, empty containers , personal visit to customer's establishment to gain first hand knowledge of his requirement

Check points for world class company

- Elimination of central storage of direct materials and supply of purchased material to the point of use without routine inspection
- Layout of most of the machines for minimisation of distance between sequential operations
- Reduction of set-up time for the products to make the batch size economical to suit customers' requirements

Check points for world class company

- Ongoing education & communication programme for existing employees regarding their role in the value of world class manufacturing
- Initiative by the employees to move to the point of need
- Any on-going programme for reducing the non-value adding activities ?

Check points for world class company

- Any on-going programme for reduction in number of qualified suppliers integrated into the business?
- Culture of total quality control
  - Right first time, zero defect, rework by self etc
- Audit of product & process quality to be within test limits
  - Concept of tolerance band or sampling

Check points for world class company

- Authority with individuals to stop the line
- Fool proofing critical jobs
  - Poka-yoke
- Maintenance of equipment by individuals themselves
  - Culture of Total Productive Maintenance, Kaizen
- Any active policy to help keep work areas clean, tidy and uncluttered
  - 5 S policy

Check points for world class company

- Interfacing between design and manufacturing for the product
- Culture of continuous improvement in customer service
  - Kaizen, marketing / service improvement, lead time reduction etc
- Mechanism to quickly and effectively receive and evaluate suggestions from all employees
  - Feedback and action

Computer integrated factory

- Future manufacturing systems (FMS)
  - Automatic factory : a logical expectation
  - Product-process technology already fairly well in place
  - Remainder is the computer integration of decision making and control and the merging of managerial technology with product-process technology in a practical operations system that functions automatically without labour

Computer integrated factory

- Demand for customisation and flexibility expected
- Capability to produce economically in small lots, even n=1, is called for
- This flexibility provides a revenue producing value for a price from the customer

- Computer will be linked by computing systems and be able to manufacture essentially perfect, customised products with no direct labour

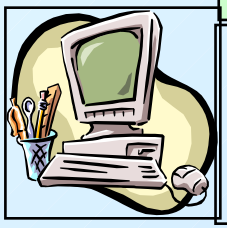
Computer integrated factory

- Each of the six major components communicates with the other component and with corporate head quarters through computers
  - Marketing feeds orders including customers' desired customisation through telecommunication network
  - New products conceived through cad and linked with manufacturing through cam
  - Computer aided systems fabricate and transfer to computer aided assembly through robotic material movement

Computer integrated factory

  - Quality as well as performance checks are automatic
  - Movement to warehouses for packing and shipping or storing and even supply off-the-shelf items automatically as per the requirement
- Factory management focused on planning , scheduling , material management,costs, quality assurance , maintenance & shipping & distribution

COMPUTER INTEGRATED MANUFACTURING

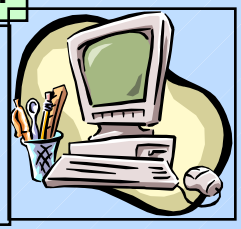


Marketing

Orders fed by tele-communication. Information on what to make including special designs fed to CAD

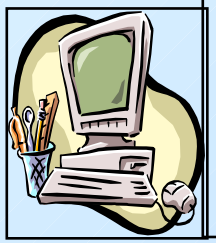
Computer Aided Fab.

Parts fabricated on NC & FMS systems involving control & material movement.



Central Computer

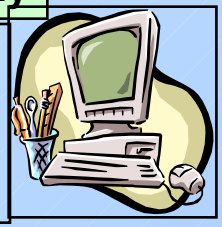
CAD/CAM



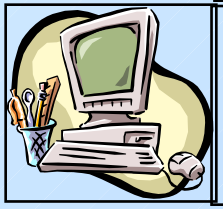
Product design & analysis for QA specs to CAM to plan for mfg. Plans and feedback to CAD/CAM interface

Automated Assembly

Robotic movement of materials & assembly. Automated QC & product test.



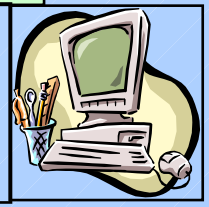
Factory Management



Planning, scheduling, material management, costs, QA, shipping and distribution.

Automated Warehousing

Robotic movement of material for storage & order picking. Automated order picking & shipping.



Flow of Information ⇢

Physical flow →

Indian Scenario

- Foreign Direct Investment out from India
- Number of foreign firms acquired or invested by Indian entities between January 2001 and October 2005: 252
- Acquisitions in USA, UK and Germany : 150
- Balance in China, Singapore, other developed as well as developing countries, spread globally
- Some of the major deals
  - Acquisition of Betapharm by Dr Reddy's Lab (570 $m)
  - Sinvest by Aban Loyd (446 $m)
  - Terapia by Ranbaxy Lab (324 $m)
  - Docpharma by Matrix Lab (263 $m)
  - Teleglobe Intl Holding by VSNL (239 $m)
  - Millenium Steel by Tisco (175)

Indian Scenario

- Acquisition of SembCorp Singapore by Punj Lloyd (Rs 100 Crores)
- Acquisition of companies by Bharat Forge in US, Europe, China and other countries
- Acquisition of Pauvels group by Crompton to become a major Transformer manufacturer
- Acquisition of Thompson by Videocon Industries
- Acquisition of companies by majors like TCS, Wipro, Marico, Nocholas Piramal, Marico and several others

Indian Scenario

- Scenario in 2006
- Current score: 307 Acquisitions
- Total Worth: $20 Billion
- Major acquisitions in 2006
  - Tata-Corus (Anglo Dutch) for $8.23 billions, total production capacity: 28MT of steel
  - Tata-Motors-CEDIS (Germany-!00% stake)
  - Tata Coffee-Eight Oclock (US-100% stake)
  - Punj Lloyd-Sembcorp (Singapor- 88% stake)
  - Apollo Tyres-Dunlop Tyres (S.Africa- 100% stake)
  - UB Group-Wine Company (France)
  - BILT-Pulp/Paper Firm (Malyasia- 78% stake)

Indian Scenario

- M&M- Stokes Group (UK- 100% stake)
- Ranbaxy- Allen SPA (Italy)
- Lupin- Artifex Finance (Belgium- 51% stake)
- Dr.Reddy- Pfizer Plant (Germany- 100% stake)
- Amtek Auto-Tyco Intl (Bermuda)
- Suzlon Energy- Hansen (Belgium- 100% stake)
- NIIT- Room Solutions (UK- 51% stake)
- Wipro Tech- Quantech (US- 100% stake)
- Pidilite-Bamco (Thailand- 75% stake)

Indian Scenario

- Further success stories
  - Moser-Baer
    - World's third largest and lowest cost producer of CDs
    - Exports over Rs. 1000 crores with companies in Europe and USA
  - Tandon Hardware
    - Exports over Rs.4000 crores
  - Asian Paints
    - Production facilities in 22 countries
  - Hero Honda
    - Largest manufacturer of motor cycles in the world
  - Sundaram Clayton
    - Awarded best supplier award by GM Motors for 2 years

Indian Scenario

- Cooper Tyres
  - Presented the gold world excellence award by Ford Motors
- Maruti
  - Exporting to Europe
- Hyundai motors
  - Exporting CKD kits worth $20 million
- TVS Motors
  - A leading two-wheeler manufacturer
  - Winner of the top quality award -Deming award
- Tata Motors
  - Acquiring Daewoo Motors-truck manufacturing in South Korea
- Ford
  - Exported Ikon kits to South Africa & Mexico

Indian scenario

- Amtek Auto
  - Taken over GWK (UK), New Smith Jones (US) and taking over Sigma (UK)
- Tisco
  - Cheapest cost producer of steel in the world
  - Investing in Natsteel of Singapur providing access to Asian market and establishing its manufacturing footprints in seven countries in Asia
- Pharma sector
  - Ranbaxy,Dr Reddy having presence all over the world
- Chatterjee-Haldia group
  - Acquiring the Netherlands-based Basell, world's largest polypropylene maker with combined capacity of 8 mt for the largest overseas takeover ever for a sum of $ 5.7 billion

Indian scenario

- Reliance
  - Acquired Flag Telecom of USA for $220 million
  - One of the largest refining capacities in the world
  - Second biggest producer of polyester fiber in the world-expecting to buy out Australia's largest polyethylene maker Quenos ,to become the largest global player
- Aditya Birla group
  - Acquisition of copper mines in Australia
  - Acquisition of Liaoning Black plant in China
  - Acquisition of cement business from L&T makes them 8th largest in the world
- Tata Tea
  - Acquired Tata Tetley of the UK in 1999-00 for $280-300m

Indian scenario

- Param Supercomputer
  - Compares with the best computer in the world
- IT Sector
  - Hewlett Packard bought out Digital Global worth Rs 1600 crores
  - HCLTechnologies purchased remaining 49% stake in Deutsche Bank for Rs. 700 crores
  - Infosys acquired Australian based Expert Information Services for $23 million ; listed on the Nasdaq
  - Wipro acquired two companies worth $ 18.7 million
  - I-flex acquired U.S. based Equinox Corporation worth $ 11 million

Indian scenario

- Bharat Forge
  - World's largest single location forging facility
  - Acquired CPD of Germany and became the second biggest forging company in the world
  - Looking for new markets like Egypt, Tunisia, China, Russia, Iran etc.
- Laxmi Mittal's steel company
  - Largest steel producer in the world with the acquisition of US based Wilbur Ross's International Steel Group- 70 million tonnes capacity
  - Arcelor-Mittal Steel acquired at $33.35 billion to become world's biggest steel producer producing more than 100 million tonnes of steel per year

Path of World-Class Manufacturing

- Fewer suppliers
- Focused factories (focus on a narrow line of products or technologies)
- Reduced number of parts (simplification and variety reduction)
- Scheduling to a rate of production instead of scheduling for batch or lot-size production
- Fewer storage racks

Path of World-Class Manufacturing

- More frequent deliveries by suppliers
- Smaller manufacturing plants
- Shorter distance moved by materials
- Less reporting (less paperwork)
- Fewer inspectors (quality at source)
- Less buffer stock (reliable suppliers)
- Fewer job classifications

Indian companies - Global Standards

- To become truly global, Indian companies must create a global presence
  - Having R&D centers, Manufacturing, Marketing etc.
  - Convert the global presence into global competitive advantage which means mastering global scale, local adaptation and knowledge transfer
- With the global companies entering India, Indian industry needs to achieve global standards

Indian companies - Global Standards

- Manufacturing sector has to improve efficiency to become globally competitive
  - Improvement in productivity, quality control, cost control , capital utilisation, customer service etc.
- Indian companies have to first become outstanding domestic companies in order to reach the global level
- Indian companies have very high potential but that potential needs to be realised

REFERENCES

- WORLD CLASS MANUFACTURING:
  SAHAY / SAXENA / ASHISH KUMAR
- MODERN PRODUCTION / OPERATIONS MANAGEMENT:
  BUFFA / SARIN
- WORLD CLASS MANUFACTURING : RICHARD J. SCHONBERGER
- TOTAL QUALITY MANAGEMENT : K. SHRIDHARA BHAT

THANK YOU

TQM &World Class Manufacturing

- TQM has become a way of life in the manufacturing
- Many firms have adopted TQM and got ISO 9000 certificates
- JIT is being implemented to reduce inventory costs and make their operations more flexible
- Some of the advanced production systems are
  - Computer aided design(CAD)
  - Computer aided manufacturing (CAM)

TQM &World Class Manufacturing

- Flexible Manufacturing systems (FMS)
  - Computer controlled group of machines to produce a variety of products
- Automated storage and retrieval systems(ASRS)
  - Automatic placement and removal of parts from computer controlled warehouses
- Automatic identification system(AIS)
  - Bar codes,radio frequency or optical characters representing data read by scanners transmitting data to computers

World Class Customers

- Manufacturer needs to be world-class customers to attract and maintain the world-class sources of supply
- Characteristics of good customers beneficial to both partners
  - Awareness to their suppliers' needs
  - Record keeping of promises made
  - Willingness to share plans and information with suppliers

World Class Customers

- Willingness to explore process and product improvement with suppliers
- Pattern of providing quick response to problems raised by suppliers
- Feedback from key suppliers and action when required

Strategies Adopted by World Class Manufacturers

- Areas relevant to achieve the competitive advantage in production and operations management
  - Manufacturing/ Operations strategy
    - Developing business and operations strategies for capturing increasing market shares of global markets

Strategies Adopted by World Class Manufacturers

- Forecasting in Operations Management
  - Effective forecasting techniques, as
    - exceptional long-range business planning systems and forecasting is integral to these plans
  - Develop excellent short-range forecasts as well to facilitate timely production of goods and services of highest quality , at the lowest cost, with little inventory while remaining responsive to customers' needs

Strategies Adopted by World Class Manufacturers

- Designing and Developing Products and Production Process
  - High product quality, high production flexibility, low production cost and high customer service considered as major strengths of world class producers
    - Continuous efforts to redesign processes important to achieve above

Strategies Adopted by World Class Manufacturers

- Production Technology- Selection and Management
  - Producers consider advanced production technology as a competitive weapon to capture world market share
  - Use of CAD,CAM,FMS , Computer Integrated Manufacturing (CIM) etc

Strategies Adopted by World Class Manufacturers

- Long-Range Capacity Planning and Facility Location
  - Carry out outstanding long-range business planning and also excel in conducting long range capacity studies
  - Provision for extra capacity in the form of capacity cushions to allow for unexpected demand, seasonal demand peeks, avoidance of diseconomies of scale etc
  - Facility location decisions involve a world-wide search for plant location sites

Strategies Adopted by World Class Manufacturers

- Plant lay- out
  - Exert great efforts to develop layouts designed for achieving competitive priorities for products
  - Strive for flexibility in the layout allowing them to change production rates & product design quickly
  - Layouts are relatively small, compact and tightly packed with major part of floor space used for production and smaller portion for inventory
  - Mostly use cellular layouts with automated handling equipment and flexible manufacturing systems

Strategies Adopted by World Class Manufacturers

- Aggregate Planning and Master Production Schedule
  - Provides the workforce,inventory, utilities and material supply contracts necessary to respond quickly
    - to customer demand producing high quality and low cost product and services over a planning horizon of 6-18 months
  - Exceptional short range planning necessary to achieve increased market shares, high quality product, low production cost and high customer satisfaction

Strategies Adopted by World Class Manufacturers

- Independent Demand Inventory Systems
  - Producers have established information systems that electronically link them with their suppliers and customers
  - Combination of real time information about customer demand and inventory
    - Lean production system enables them to reduce production and inventory costs and improved product quality and customer responsiveness

Strategies Adopted by World Class Manufacturers

- Resource – Requirement Planning
  - World class producers have adopted Material Requirement Planning (MRP), Capacity Requirement Planning (CRP), Manufacturing Resources Planning (MRP II) and Enterprise Resources Planning (ERP) over a period of time
  - These improvements enable them to achieve higher product quality, lower production costs and greater responsiveness to customer needs increasing their market share

Strategies Adopted by World Class Manufacturers

- Shop floor Planning and Control in Manufacturing
  - Lot sizes drastically reduced, in-process inventories slashed and customer responsiveness greatly improved
  - Increasing use of computer information systems including scheduling information and scheduling decisions like SAP-R/3, Macola, Order Links etc

Strategies Adopted by World Class Manufacturers

- Planning and Scheduling Service Operations
  - Successful producers have adopted advanced and well known planning, analysing and controlling approaches that were first developed in manufacturing, where appropriate, and
  - Have recognised the unique properties of service operations and developed novel management approaches for these operations

Strategies Adopted by World Class Manufacturers

- Just-in-time Manufacturing
  - Producers have switched their operations to JIT so that they can engage in time-based competition
  - Had to invest heavily in engineering studies and equipment modifications
    - to drastically reduce set-up times,
    - training programmes to train workers for multiple skills, and
    - new business strategies with narrower product lines that allow stable and level production schedules

Strategies Adopted by World Class Manufacturers

- Supply-chain Management
  - Supply chain managers of world class producers plan and control all activities related to movement of materials, from suppliers,through the production process and to customers
  - Form partnerships with suppliers to quickly produce products of near perfect quality precisely when needed and with little inventory
  - Close by located suppliers preferred
  - Use computer models to develop and optimise shipping plans for manufacturing and service operations

Strategies Adopted by World Class Manufacturers

- Productivity, Teamwork and Empowerment
  - Employees are of both strategic and tactical importance as
    - they directly affect product costs, product quality, customer satisfaction, and
    - the successful implementation of such strategic initiatives as installing high tech production systems, JIT and TQM
  - Workers hired have problem solving abilities and trained in multiple skills
  - Workers must have the state-of-the-art technology, machine and tools and product must be designed for manufacturability

Strategies Adopted by World Class Manufacturers

- Quality Management & Quality Control
  - World class producers commit tremendous resources to put in place Total Quality Management programmes aimed at continuous quality improvement
  - Apply for a Malcom Baldrige National Quality Award and the Deming Prize and quality for the ISO 9000 standards in the coming years
  - Understand that quality can not be inspected but has to be built into the product
  - Effective Quality control achieved through use of statistical techniques, automating inspection and testing

Strategies Adopted by World Class Manufacturers

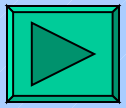
- Maintenance Management and Reliability
  - World class manufacturers give much of the responsibility for repairs and preventive maintenance to workers
  - Implement TPM programmes for maintenance management
  - Extensively use computers in maintenance management for scheduling maintenance projects, inventory systems for spare parts and parts failure data

GAINING COMPETITIVE EDGE THROUGH WORLD CLASS MANUFACTURING

- GOALS OF WCM EFFORTS INCLUDE MAINTAINING MARKET SHARE , IMPROVING PROFITABILITY AND IMPROVING THE FIRM'S ABILITY TO COMPETE IN GLOBAL MARKETS
- PRINCIPLES OF IMPROVING MANUFACTURING PERFORMANCE ARE WELL KNOWN
- INORDER TO ESTABLISH THE RELATIONSHIP BETWEEN MANUFACTURING PERFORMANCE AND BUSINESS PERFORMANCE OR WORLD MARKET DOMINANCE, A CONCEPTUAL FRAME WORK WAS NEEDED TO REPRESENT THIS RELATIONSHIP

HALL'S FRAMEWORKS TO VALUE ADDED ENGINEERING

- PROPOGATED BY HALL IN 1987
- MANUFACTURING EXCELLENCE ATTAINED BY VALUE ADDED MANUFACTURING BASED ON THE PRINCIPLE
  - ELIMINATE ANYTHING THAT DOES NOT ADD VALUE TO THE PRODUCT OR SERVICE
    - MATERIAL, EQUIPMENT, SPACE, TIME, ENERGY, SYSTEMS OR HUMAN ACTIVITY OF ANY SORT
- ALREADY SUGGESTED BY SHIGEO AS 7 WASTES IN MANUFACTURING
- FRAMEWORK DESCRIBED IN 3 OVERLAYING CATEGORIES OF WORK
  - TOTAL QUALITY
  - JIT MANUFACTURING
  - PEOPLE INVOLVEMENT



SCHONBERGER'S FRAMEWORK

- PROPOGATED BY SCHONBERGER IN 1986
- GOAL OF WORLD CLASS MANUFACTURING IS CONTINUAL AND RAPID IMPROVEMENT
- WORLD CLASS STATUS CAN BE ACHIEVED BY ANY OF THE PARALLEL PATHS
  - QUALITY PATH
    - TQC PRINCIPLE : DO IT RIGHT THE FIRST TIME
  - JIT PRODUCTION PATH
    - SMALLER THE LOT, BETTER IT IS
  - TOTAL PRODUCTIVE MAINTENANCE
    - COMPREHENSIVE MAINTENANCE ACTIVITY TO BE CARRIED OUT BY OPERATOR (THE "OWNER") AND NOT ONLY BY MAINTENANCE SPECIALISTS TO ENSURE ZERO BREAKDOWN OF EQUIPMENT

SCHONBERGER'S FRAMEWORK

- CONTINUAL IMPROVEMENT IN QUALITY, COST, LEAD TIME, CUSTOMER SERVICE & FLEXIBILITY LEAD TO WORLD CLASS STATUS
- ADVOCATES TO PRODUCE SOME OF EVERY TYPE EVERY DAY AND IN QUANTITIES SOLD THAT DAY
- ADVOCATES FOR CELLULAR MANUFACTURING, DEVIATION REDUCTION AND VARIABILITY REDUCTION

GUNN'S MODEL

- PROPOGATED IN 1987
- WORLD CLASS MANUFACTURING RESTS ON 3 PILLARS
  - COMPUTER INTEGRATED MANUFACTURING
  - TOTAL QUALITY CONTROL
  - JIT MANUFACTURING
- ALL THE THREE MUST BE ADDRESSED SIMULTANOUSLY IN ORDER TO GAIN COMPETITIVE ADVANTAGE IN MANUFACTURING

MASKELL'S MODEL

- WORLD CLASS MANUFACTURING INCLUDES
  - A NEW APPROACH TO PRODUCT QUALITY
    - ZERO DEFECT
    - TOTAL QUALITY CONTROL
  - JIT PRODUCTION TECHNIQUES
    - NO INVENTORY

MASKELL'S MODEL

- CHANGE IN THE WAY THE WORK FORCE IS MANAGED
  - TRANSFERRING RESPONSIBILITY
  - EDUCATION & CROSS TRAINING
  - PROBLEM SOLVING & QUALITY CIRCLES
- FLEXIBLE APPROACH TO CUSTOMER REQUIREMENT
  - PRODUCTION FLEXIBILITY
  - DESIGN FLEXIBILITY
    - NEW PRODUCTS AND MODIFICATION TO EXISTING PRODUCTS

AMERICA'S BEST PLANT MODEL

- CHARACTERISTICS OF WORLD CLASS MANUFACTURING IDENTIFIED BY THREE CORE STRATEGIES
  - CUSTOMER FOCUS
  - QUALITY
  - AGILITY : ABILITY TO QUICKLY, EFFICIENTLY & EFFECTIVELY RESPOND TO CHANGE
- SIX SUPPORTING COMPETENCIES HELP THE PLANTS ACHIEVE THE GOALS DEFINED IN THE THREE CORE STRATEGIES
  - EMPLOYEE INVOLVEMENT
  - SUPPLY MANAGEMENT
  - TECHNOLOGY
  - PRODUCT DEVELOPMENT
  - ENVIRONMENTAL RESPONSIBILITY & SAFETY
  - CORPORATE CITIZENSHIP

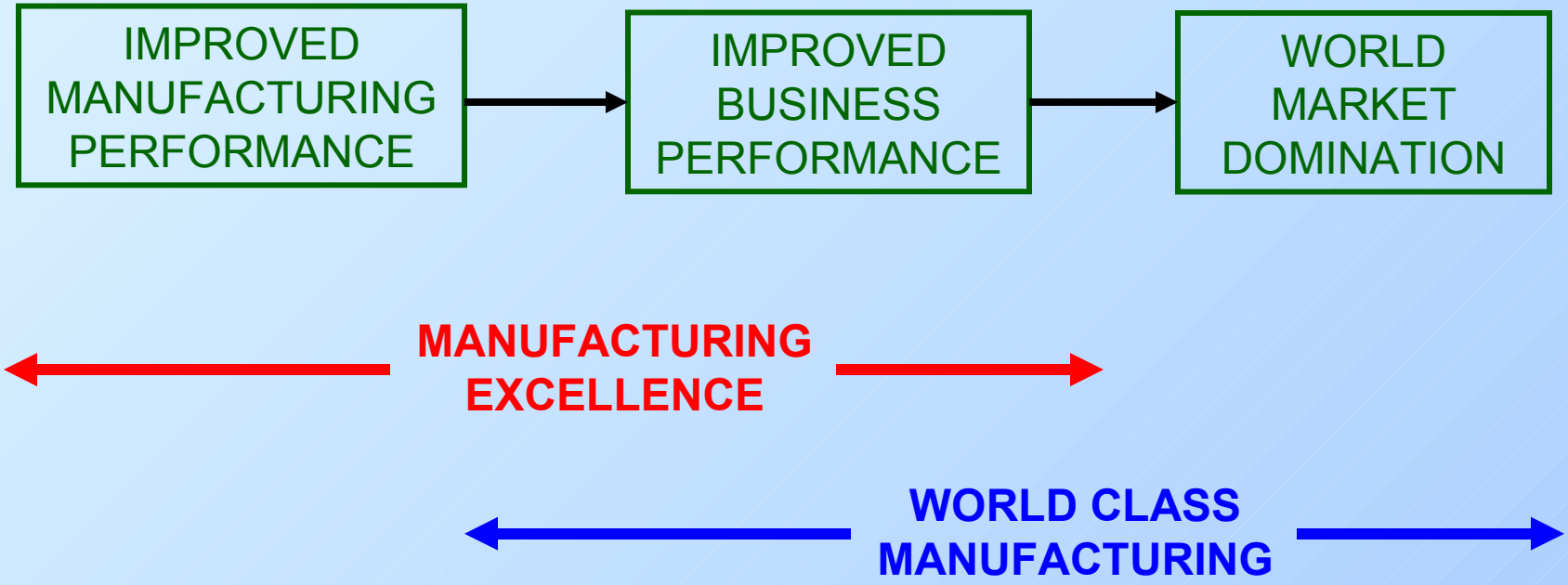
AMERICA'S BEST PLANT MODEL

- QUALITY VIEWED AS DEFECT FREE, WASTE FREE WORKMANSHIP THAT DERIVES FROM PRODUCT & PROCESS QUALITY
- AGILITY DEFINED AS LEAN MANUFACTURING & JIT SUPPLY PRACTICES, FLEXIBLE PRODUCTION STRUCTURES, FAST, CLEAN SLATE PROCESS REDESIGN AS ADVOCATED IN RE-ENGINEERING AND MASS CUSTOMISATION PRODUCTION STRATEGIES

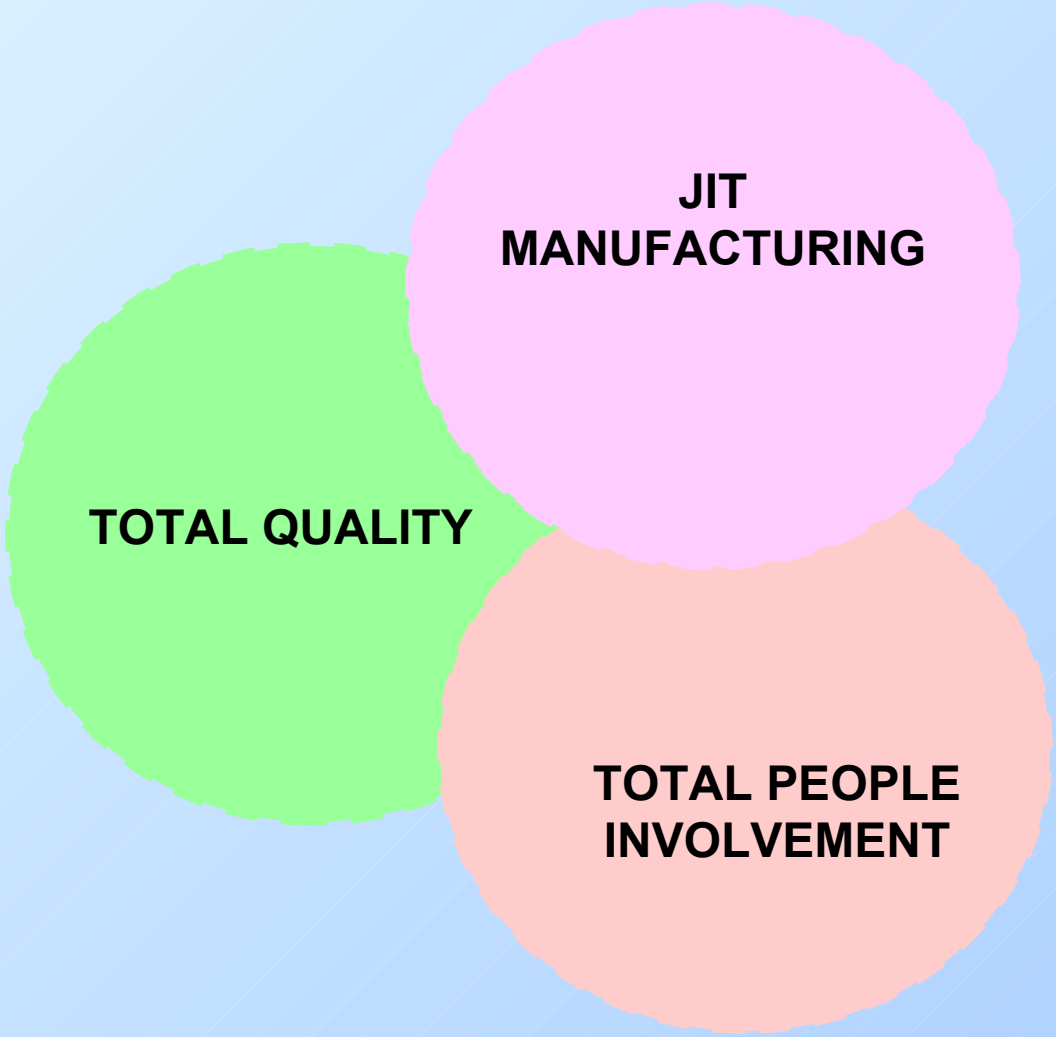
WORLD CLASS MANUFACTURING

- WORLD CLASS MANUFACTURING COMPANIES ARE THOSE THAT DEMONSTRATE INDUSTRY BEST PRACTICES
- COMPANIES TO ATTEMPT TO BE THE BEST AT EACH OF THE COMPETETIVE PRIORITIES (QUALITY, PRICE, DELIVERY PERIOD, DELIVERY RELIABILITY, FLEXIBILITY & INNOVATION)
- ORGANISATION TO AIM AT MAXIMISING PERFORMANCE IN THESE AREAS IN ORDER TO MAXIMISE COMPETETIVENESS
- IF RESOUCES DO NOT PERMIT IMPROVEMENT IN ALL AREAS, ORGANISATIONS SHOULD CONCENTRATE ON MAINTAINING PERFORMANCE IN QUALIFYING FACTORS AND IMPROVING COMPETETIVE EDGE FACTOR
- THE PRIORITIES WILL CHANGE OVER TIME AND MUST THEREFORE BE REVIEWED

WORLD CLASS MANUFACTURER



MANUFACTURING EXCELLENCE THROUGH VALUE ADDED MANUFACTURING



WORLD CLASS MANUFACTURING

- CONTROL OF OPERATIONS
- FIVE BENEFICIAL THINGS TO DO TO MAKE ANY CONTROL EASIER TO IMPLEMENT & MAKE SYSTEM WORK BETTER
  - REDUCE SET-UP TIME
    - SINGLE MINUTE EXCHANGE OF DIES(SMED)
  - FORM NATURAL GROUPS
    - CELLS
  - REDUCE THROUGHPUT TIMES
    - REDUCE WORK IN PROCESS
  - POSTPONE PRODUCT MUTATION
  - REMOVE THE TRIVIAL MANY TO FOCUS ON VITAL FEW

WORLD CLASS MANUFACTURING

- MANUFACTURING INVOLVES TECHNOLOGY THAT HAS TWO ASPECTS
  - TECHNOLOGY OF PRODUCT
  - TECHNOLOGY OF PROCESS
- WHILE BOTH OF THESE CAN BE PURCHASED, ORGANISATION'S COMPETITIVENESS IS DETERMINED BY HOW WELL THESE ARE PUT TO USE

WORLD CLASS MANUFACTURING

- MANUFACTURING IS A COMPREHENSIVE ACTIVITY INCLUDING THE CONVERSION PROCESS, MATERIAL HANDLING, ASSEMBLY, QUALITY CONTROL, FABRICATION OF PARTS, MAINTENANCE OF EQUIPMENT AND TOOLING, MIS, HUMAN RESOURCES ETC
- MANUFACTURING EXCELLENCE CALLS FOR CONTINUED EXCELLENT PERFORMANCE OF EACH OF THESE ACTIVITIES IN ORDER TO GUARANTEE SUCCESS

WORLD CLASS MANUFACTURING

- A MANAGER MUST KEEP 5 GOALS IN MIND TO ACHIEVE EXCELLENCE
  - THROUGHPUT SHOULD GO UP
  - INVENTORY SHOULD COME DOWN
  - OPERATING EXPENSES SHOULD COME DOWN
  - CYCLE TIME SHOULD COME DOWN
  - YIELDS SHOULD GO UP
- IMPROVED COMPETETIVENESS REFERRED TO AS MANUFACTURING EXCELLENCE
  - DEEMED TO BE DEMONSTRATED BY SIMULTANEOUS IMPROVEMENTS IN MANUFACTURING PERFORMANCE AS WELL AS BUSINESS PERFORMANCE
    - THROUGH INDICATORS SUCH AS PRODUCTIVITY, COST REDUCTION AND MARKET SHARE IN THE WORLD MARKET

WORLD CLASS MANUFACTURING….contd

- FIRM WILL BE CALLED WORLD CLASS MANUFACTURER IF IT CONTINUES TO EXCEL IN MANUFACTURING AND DOMINATE WORLD MARKET