Automation (21-541)

Advanced Manufacturing Laboratory
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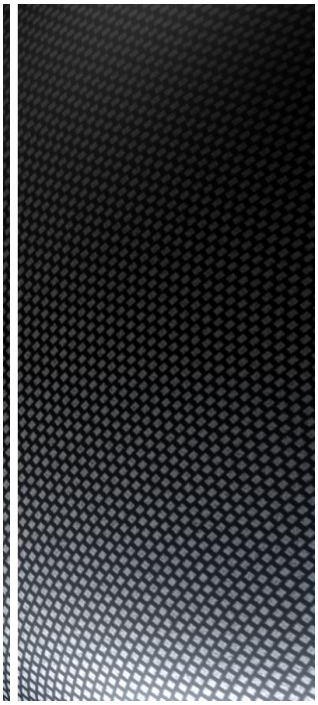
Session # 6



Session Schedule

- *Product lifecycle management (PLM) from automation and CIM perspective*
  - *Automation & CIM role in Product development*
    - *(Cont…) Concurrent engineering and automation & CIM considerations*
  - *Automation & CIM role in PLM*
    - *Overview of PLM CIM software solutions*

Product lifecycle management (PLM)

- *Sequential Engineering:*
  - *The traditional product development process at the prototype development stage is sequential.*
  - *It includes*
    - *Product design,*
    - *Development of manufacturing process and*
    - *Supporting quality and testing activities*
  - *Which are all carried out one after another.*

Product lifecycle management (PLM)

- *Concurrent Engineering:*
  - *Concurrent engineering or Simultaneous Engineering is a methodology of restructuring the product development activity in a manufacturing organization*
  - *This is accomplished through using a cross functional team approach and is a technique adopted to improve the efficiency of product design and reduce the product development cycle time.*
  - *Concurrent engineering is also sometimes referred to as Parallel Engineering.*
  - *Concurrent Engineering brings together a wide spectrum of people from several functional areas in the design and manufacture of a product.*

Product lifecycle management (PLM)

- *Concurrent Engineering merits:*
  - *Reduction in the number of design changes*
  - *Cost of changes in design*
  - *Holistic approach to product development*
  - *Robust products*
  - *Reduction in lead time for product development*

Product lifecycle management (PLM)

- *Concurrent Engineering implementation via CIM:*
  - *Concurrent (Simultaneous) Engineering is an orthogonal concept that defines how concurrent and simultaneous work flows are organized and the information flow, storage, retrieval and decision making can be supported and controlled.*
  - *Information Technology(IT) is the backbone of CE.*
  - *Software tools are available today to perform all the manufacturing related activities.*
  - *CIM tries to permit almost seamless transfer of data from one application to another.*

Product lifecycle management (PLM)

- *Concurrent Engineering implementation via CIM:*
  - *In every phase of the product development, from concept to final design, sufficient information has to be provided to the product development team*
  - *The members of the team need to take the right decisions with respect to*
    - *production,*
    - *production planning and*
    - *product support.*
  - *Special attention has to be given to the adoption of new production technologies and to take make or buy decisions including the early integration of the suppliers into the development process.*

Product lifecycle management (PLM)

- *Concurrent Engineering implementation via CIM:*
  - *Through CIM concept, information systems have to be developed which integrate the different engineering disciplines*
  - *CIM moreover integrates the various engineering support tools, promoting and pushing a conversion of the currently practiced sequential work flow into a more concurrent work flow*
    - *with a higher degree of parallelism to shorten the product development lead-time.*

Product lifecycle management (PLM)

- *Concurrent Engineering implementation via CIM:*
  - *CIM offers a variety of tools for implementing some form of concurrent engineering.*
    - *Knowledge based engineering, production tools and communication tools*
    - *Relational database management systems for data management*
    - *Work flow automation and product life cycle management (PLM) systems*
    - *Decision support systems*
    - *Enterprise resource planning systems*

Product lifecycle management (PLM)

- *PLM and automation and CIM considerations:*
  - *Old Fashion: Manufacturing, very often has been based on the concept of make to stock.*
  - *Today's fashion: Many manufacturers follow the concepts of*
    - *assembled to order or*
    - *engineered to order.*

Product lifecycle management (PLM)

- *PLM and automation and CIM considerations:*
  - *PLM has faced with:*
    - *Cost efficiency*
    - *Product quality*
    - *Design for manufacture and assembly*
    - *Time to market*
    - *Serviceability*

Product lifecycle management (PLM)

- *PLM and automation and CIM considerations:*
  - *PLM challenges:*
    - *The concept of making all parts or subassemblies of a product under one roof is giving way to massive outsourcing.*
    - *The design and manufacturing activity is carried out not in one location but in many locations distributed all around the world.*
    - *The manufacturing value chain is more complex and in order to efficiently manufacture a product today depends much on the entire life cycle of a product as a process that can be*
      - *managed,*
      - *measured,*
      - *monitored and*
      - *modified to achieve continuous improvement.*

Product lifecycle management (PLM)

- *PLM and automation and CIM considerations:*
  - *PLM challenges:*
    - *Another critical requirement is in managing design changes.*
    - *Product changes should be reflected in all the drawings and bill of materials concerned so that the design changes can be seamlessly incorporated.*
    - *The PLM should support that manufacturers acquire the capability to collaborate internally and externally*
    - *This collaboration should encompass product development, manufacture, market and service till the retirement of the product, consistently maintaining the highest possible efficiency throughout the value chain.*

Product lifecycle management (PLM)

- *PLM and automation and CIM considerations:*
  - *Characteristics of a PLM solution:*
    - *Engineering design*
    - *Knowledge management and process automation*
    - *Product visualization*
    - *Real time collaboration*
    - *Managing life cycle projects*
    - *Assessing and capturing customer requirements*
    - *Supply chain management*
    - *Manufacturing*
    - *Servicing capability*

Product lifecycle management (PLM)

- *PLM and automation and CIM considerations:*
  - *Characteristics of a PLM solution:*
    - *Engineering design*

    Multiple CAD/CAE/CAM software are used by designers to create designs.
    These are used for product design which includes
    creation of designs,
    release of designs,
    design management,
    engineering process management,
    digital validation,
    change management and
    design collaboration in multi-sites.

Product lifecycle management (PLM)

- *PLM and automation and CIM considerations:*
  - *Characteristics of a PLM solution:*
    - *Knowledge management and process automation*

    Visualization and collaboration capabilities enable team members to view the digital mock up or exchange product representations.

    Moreover, process management, change management, parts classification, release management, and version management should be supported through the PLM solutions.

Product lifecycle management (PLM)

- *PLM and automation and CIM considerations:*
  - *Characteristics of a PLM solution:*
    - *Product visualization*

Visualization includes 2D/3D markup, dynamic cross sectioning and measurements capabilities.

Sales and marketing organizations, suppliers, customers etc. are part of the extended life cycle family and they have an important role in configuring the product at the conceptual design stage.

Product lifecycle management (PLM)

- *PLM and automation and CIM considerations:*
  - *Characteristics of a PLM solution:*
    - *Real time collaboration*

Secure, adaptive and user friendly real time collaborative environment is required to facilitate rapid sourcing, carry out concept studies, program reviews, design reviews, and for incorporating engineering changes.

Product lifecycle management (PLM)

- *PLM and automation and CIM considerations:*
  - *Characteristics of a PLM solution:*
    - *Managing life cycle projects*

Creating, maintaining and monitoring project schedules that reflect tasks, dependencies, milestones and start to finish dates are very important to carry out a successful project

Project tracking and reporting capabilities are useful for executives to create updates

- *Assessing and capturing customer requirements*

Product lifecycle management (PLM)

- *PLM and automation and CIM considerations:*
  - *Characteristics of a PLM solution:*
    - *Supply chain management*

Sourcing is an important activity and efficient management of sourcing plays an important role in productivity, cost control and shortening time to market.

The product development team can assess through the various functionalities of this module each prospective supplier in terms of design content, cost efficiency and product quality as well as supplier's capabilities.

Product lifecycle management (PLM)

- *PLM and automation and CIM considerations:*
  - *Manufacturing*
    - *Part manufacturing planning*
    - *Assembly process planning*
    - *Factory layout and analysis*
    - *Robot programming and simulation*
    - *Worker safety and ergonomic studies*
    - *Computer aided manufacturing*
  - *Servicing capability*

  The processes associated with maintaining, repairing and overhauling machinery and equipment should be digitally enabled.