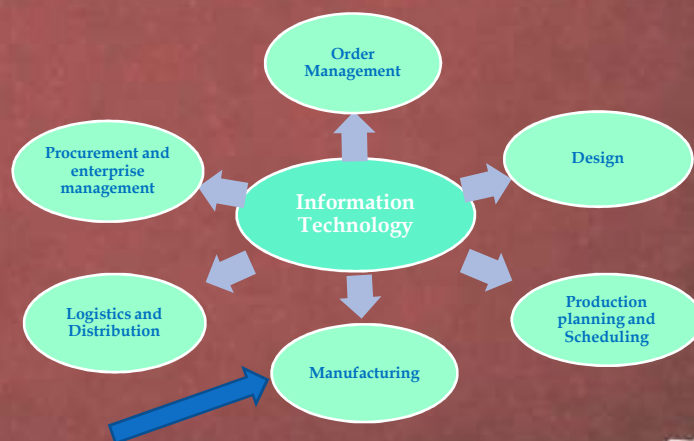


Computers In Manufacturing Enterprises

Lecture 5: Case Studies on Role of IT
August 6, 2015

Vandana Srivastava

Role of IT in Manufacturing - Recap



Case 1: Ford Manufacturing Water Saving Technologies

already achieved its goal of decreasing water use per vehicle by 30 percent from 2009 to 2015 by using:

- ✓ **3-Wet Paint Technology**
 - ❖ consolidation of painting activities in an integrated booth, which eliminates one booth water wash

- ✓ **Dry Paint Overspray System**
 - ❖ eliminates water usage from the painting process, resulting in an 80 percent water savings for air conditioning/air tempering
 - ❖ 100 percent water savings from paint-over-spray separation, based on production volume of 158,000 units per year

- ✓ **Minimum Quantity Lubricant (MQL)**
 - ❖ uses an extremely small amount of oil versus conventional wet-machining
 - ❖ for a typical production line of 450,000 vehicles, can save 282,000 gallons of water per year

<http://corporate.ford.com/microsites/sustainability-report-2013-14/water-saving>

Case 1: Ford Manufacturing Water Saving Technologies

- ✓ **Internal Water Metering**
 - ❖ increasing usage of internal water metering to identify additional water saving opportunities
 - ❖ drive conservation behaviour to the departments
 - ❖ potential to save approximately \$75,000 on average per plant globally

- ✓ **Cooling Tower Technology**
 - ❖ cooling towers are one of the biggest users of water at plant
 - ❖ use of new technologies such as electrolytic water softening to increase cooling tower cycles of concentration, thus lowering water consumption

- ✓ **Sustainable Storm water Practices**

<http://corporate.ford.com/microsites/sustainability-report-2013-14/water-saving>

Case Study 2: Boeing (2004)



pioneering processes

- ❖ use of high-speed machining, friction stir joining, automated fiber placement and stitched resin film infusion
- ❖ producing large, one-piece metallic and composite structures that are stronger and lighter than multi-piece structures
- ❖ much faster and cheaper to produce
- ❖ used to produce the forward fuselage for the F/A-18E/F, the redesigned fuselage has 40% fewer parts, 51% fewer fasteners, takes 31% less time to build
- ❖ lower costs for Boeing
- ❖ the new fuselage last three times longer than required to ensure low lifecycle cost and high operational readiness



http://www.boeing.com/news/frontiers/archive/2004/december/ts_sf03.html

Case Study 3: Infosys

Automating Furnace operations to save energy and reduce losses (Sep 2009)

Client

aluminium manufacturer faced challenges in its melting furnace operations and lacked an integrated process control resulting in energy wastage, loss of molten metal and sub-optimized processes

Prevalent setup

- Weight of the charge put into furnace was not measured
- Calculation of amount of energy and time spent was based on guesswork
- Unnecessary waste of energy and overheating of the metal due to excessive burner operation

<http://www.infosys.com/industries/resources/case-studies/Documents/furnace-optimization-automation.pdf>

Case Study 3: Infosys contd...

Solution by Infosys

- ❖ Designed and developed a SCADA based solution to automate furnace operations

SCADA: Supervisory Control and Data Acquisition system allows an operator at a master facility that coordinates processes among various remote sites



eliminates the need for service personnel to visit each site for inspection, data collection, make adjustments, system modifications, etc



Saves time and money

- Integrate a forklift mounted real-time measurement system to feed the charge weight into the control system
- visual signal displays were developed to indicate loading completion based on furnace capacity
- based on recording of input parameters, the SCADA system could calculate the melting cycle time and provide appropriate burner control set-points → improved temperature control



- implementation in 100+ furnaces saves million of dollars
- reduction in energy consumption / stack emissions / overall cycle time

<http://www.infosys.com/industries/resources/case-studies/Documents/furnace-optimization-optimization.pdf>

Latest & Upcoming Technologies in Manufacturing

New

- lot of collaboration is being done with Universities by manufacturers
- companies are spending significant money in R & D

Technology: Ford Motor Company (2013)

- Ford Freeform Fabrication Technology (F3T)
 - unique, patented manufacturing process developed at the Ford Research and Innovation Center
 - method: a piece of sheet metal is clamped around its edges and formed into a 3D shape by two stylus-type tools working in unison on opposite sides of the sheet metal blank
 - as a digital printer, after the CAD data of a part are received, computer-generated tool paths control the F3T machine to form the sheet metal part into its final shape to the required dimensional tolerances and surface

<http://corporate.ford.com/news-center/press-releases-detail/pr-ford-develops-advanced-technology-38244>

Technology: Ford Motor Company (2013)

Benefits:

- Low cost:
Geometric-specific forming dies are completely eliminated, along with the high cost and long lead time associated with die engineering, construction and machining
- Fast delivery time:
enable the delivery of a sheet metal part within 3 business days from the time the CAD model of the part is received, earlier parts are delivered anywhere from 2-6 months
- More flexibility:
 - help to improve the vehicle R & D,
 - more flexibility in quickly creating parts for prototypes and concept cars
 - Currently, creating a prototype die can take six to eight weeks, and developing a full
 - prototype vehicle usually takes several months and up to hundreds of thousands of
 - dollars
 - could produce sheet metal parts for prototypes in just days for essentially no
 - greater personalization options, buyers can customize vehicle bodywork

https://www.youtube.com/watch?v=Wl5_wUVxRvw

Upcoming Technologies!

- Use of robots
example: <http://www.rethinkrobotics.com/resources/videos/>
- 3D Printing
example: <http://www.stratasys.com/industries/aerospace>
- Nanotechnology
manipulation of matter on atomic, molecular and supramolecular scales
example: <https://www.youtube.com/watch?v=ufIH5XdOMw>
- The Internet of Things (IoT)
 - electronic devices connected to each other, within the existing Internet infrastructure, communicate with one another without human intervention
 - send and receive critical notifications
 - example is defected or damaged notification
 - results in reduced downtime, increased quality, reduced waste and less over costs

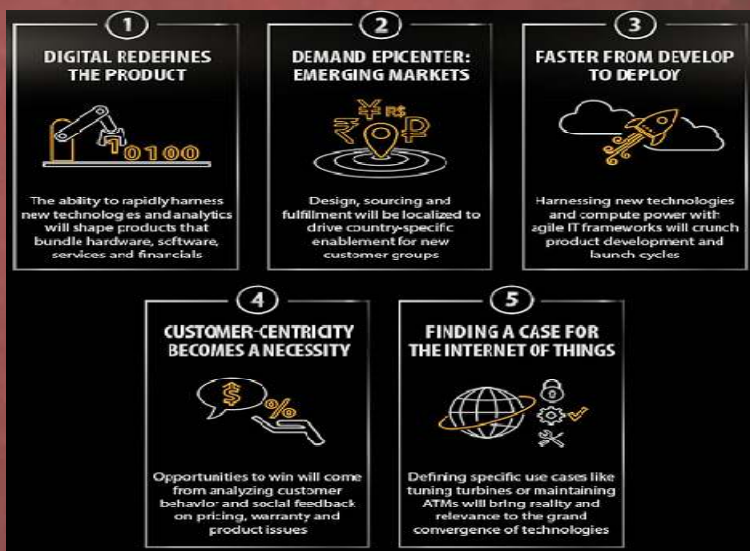
<http://cerasis.com/2015/01/13/manufacturing-technology/>

Upcoming Technologies!

- Cloud Computing
 - can be implemented in manufacturing plants spread out in various geographic areas in order to share data quickly and efficiently
- Big Data and Predictive Maintenance Technology
 - technologies that allow manufacturers to collect, process and measure big data in real time
 - Predictive maintenance technology helps predict snags and defects and thus cuts downtime and costs

<http://cerasis.com/2015/01/13/manufacturing-technology/>

Manufacturing Trends - 2015 by Infosys



<http://www.experienceinfosys.com/ManufacturingTrends>