ANALYTICAL STUDY ON INTEGRATED OPTIMIZATION QUALITY IN COMPUTER MANUFACTURING
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ABSTRACT - The significance of Computer-Integrated Manufacturing (CIM) to the eventual fate of U.S. fabricating can't be exaggerated. It is a key fixing in enhancing the efficiency, productivity, and benefit of the U.S. mechanical base and in regaining an aggressive position on the planet commercial center. PC incorporated assembling is the view of assembling that perceives that the distinctive ventures in the advancement of a made item are interrelated and can be refined more adequately and effectively with PCs. The Computer Integrated Manufacture System (CIMS) was created and actualized progressively by worldwide assembling, which depends on computers and joined with deliver and administration in association CIMS exceedingly incorporates data asset and best blend the market request estimate, items' improvement and configuration, fabricating craft work, items' quality, execution gauge and even items' Deals.

I. INTRODUCTION

It is the utilization of computer methods to incorporate assembling exercises. These exercises envelop all capacities important to make an interpretation of client needs into a last item. CIM begins with the advancement of an item idea that may exist in the promoting association; incorporates item outline and detail, as a rule the obligation of a designing association; and reaches out through creation into conveyance and after-deals exercises that live in a field administration or deals association. Reconciliation of these exercises requires that precise data be accessible when required and in the organization required by the individual or gathering asking for the information. Information may come specifically from the starting source or through a middle of the road database as indicated by Jorgensen and Krause. CIM frameworks have risen subsequently of the advancements in assembling and computer innovation.

The computer assumes a critical part incorporating the accompanying utilitarian regions of a CIM framework:

- **Part and item outline:** There are four stages that are essential partially and item outline. They incorporate preparatory outline, refinement, investigation, and execution.

- **Apparatus and installation plan:** Tooling engineers utilizing computer-supported plan (computer aided design) devices to build up the frameworks or apparatuses that create the parts.

- **Prepare arranging:** The procedure organizer plans an arrangement that frameworks the courses, operations, machines, and apparatuses required. He or she additionally endeavors to limit cost, fabricating time, and machine sit without moving time while expanding profitability and quality.

- **Programming:** Programming of numerically controlled machines and material taking care of frameworks.
- **Generation arranging**: There are two ideas utilized here including materials necessity arranging (MRP) and machine stacking and booking.

- **Machining**: This is a piece of the genuine assembling process, including turning, penetrating, and confront processing for metal evacuation operations. Get together. After they are fabricated, parts and subassemblies are assembled with different parts to make a completed item or subassembly.

- **Upkeep**: Computers can screen, intercede, and even right machine breakdowns and additionally quality issues inside assembling. Quality control: This includes three stages including framework plan, parameter outline, and resistance outline. Assessment: This stage figures out whether there have been mistakes and quality issues amid the assembling of the item.

- **Capacity and recovery**: These assignments include crude materials, work-in-process stock, completed products, and hardware.

**CIM Hardware and CIM software**

CIM Hardware contains the accompanying:

- Computers, controllers, CAD/CAM frameworks, workstations/terminals, information section terminals, scanner tag peruses, RFID labels, printers, plotters and other fringe gadgets, modems, links, connectors and so on.,

- Manufacturing hardware, for example, CNC machines or automated work focuses, mechanical work cell, DNC/FMS frameworks, work taking care of and apparatus taking care of gadgets, stockpiling gadgets, sensors, shop floor information accumulation gadgets, review machines and so forth.

![Figure1: working framework of Hardware and software of CIM](image)

CIM programming involves PC projects to complete the accompanying capacities:

- Materials Handling
- Device Drivers
- Process Planning
- Manufacturing Facilities Planning
- Work Flow Automation
Evolution of computer integrated manufacturing
The primary real advancement in machine control is the Numerical Control (NC), showed at MIT in 1952. Early Numerical Control Systems were all fundamentally hardwired frameworks, since these were worked with discrete frameworks or with later original coordinated chips. Early NC machines utilized paper tape as an info medium. Each NC machine was fitted with a tape peruse to peruse paper tape and exchange the program to the memory of the machine instrument obstruct by square. Centralized computer PCs was utilized to control a gathering of NC machines by mid 60's. This course of action was then called Direct Numerical Control (DNC) as the PC avoided the tape peruses to exchange the program information to the machine controller. By late 60's smaller than normal PCs were by and large ordinarily used to control NC machines. At this stage NC turned out to be genuinely delicate set up with the offices of mass program stockpiling, disconnected altering and programming rationale control and handling. This advancement is called Computer Numerical Control (CNC). Since 70's, numerical controllers are being outlined around chip, bringing about minimized CNC frameworks. A further improvement to this innovation is the circulated numerical control (additionally called DNC) in which handling of NC program is completed in various PCs working at various progressive levels - regularly from centralized computer have PCs to plant PCs to the machine controller. Today the CNC frameworks are worked around capable 32 bit and 64 bit microchips. PC based frameworks are additionally turning out to be progressively prevalent.

Nature and role of the elements of CIM system
Nine noteworthy components of a CIM framework are in Figure 2 they are,

- Warehousing
- Logistics and Supply Chain Management
- Finance
- Marketing
- Product Design
- Planning
- Purchase
- Manufacturing Engineering
- Factory Automation Hardware
- Information Management

Figure 2: Elements of CIM system

CIM is perceived as Islands of Automation. They are:
1. CAD/CAM/CAE/GT
2. Manufacturing Planning and Control.
3. Factory Automation
4. General Business Management

Figure 3: Applied model of assembling

OBJECTIVES
- Describe the fundamental concepts of CIM,
- Explain enterprise wide integration of CIM and concept of CIM wheel,
- Know the scope of CIM,
- To gain knowledge on how computers are integrated at various levels of planning
- To gain knowledge about the basic fundamental of CAD.
- This course will enable the student
II. REVIEW OF LITERATURE

CIM is the manufacturing approach to integrate all manufacturing functions using computers to control the entire manufacturing organization. CIM relies on closed-loop control processes based on real-time input from sensors. This integration approach allows individual manufacturing functions to exchange information with each other and initiate actions. Through the integration of computers, production of product can be improved, faster and less error. The main advantage of CIM is the ability to create automated production processes. According to Kusiak, the computer plays an important role in integrating the following functional areas in CIM system: part and product design, tool and fixture design, process planning, programming of numerically machines and material handling systems, production planning, machining and assembly, maintenance, quality control, inspection, and storage and retrieval system [3]. In the past in comparison between Japanese and the American and the European manufacturing organizations, the literature shows that; Japanese companies spend 66% on definition, 24% on design, and 10% on redesign, American companies spend 17% on definition 33% on design and 50% on redesign, European companies spend 17% on definition 33% on design and 50% on redesign [4]. CIM is the manufacturing approach of using computers to control the entire production process [5]. This integration allows individual processes and functions to exchange information with each other and initiate actions. Through the integration of computers, manufacturing can be faster and less error-prone, although the main advantage is the ability to create automated manufacturing processes. CIM is the manufacturing approach of using computers to control the entire production process [6].

III. RESEARCH METHODOLOGY

This Figure demonstrates the model of the elements of manufacturing in factory.

![Figure 4: Model of the factory showing five functions of manufacturing](image)

1. Distribution of job

In order to spread the job to be done on the line among its stations, the job must be divided into its component tasks. The minimum rational work elements are the smallest practical indivisible tasks into which the job can be divided. These work elements cannot be subdivided further. For example, the drilling of a hole would normally be considered as a minimum rational work element. In manual assembly, when two components are fastened together with a screw & nut, it
would be reasonable for these activities to be taken together. Hence, this assembly task would constitute a minimum rational work element.

2. Kilbridge & Wester method Problem: The following list defines the precedence relationships & element times for a new model toy:

| Table 1: Precedence relationships & Element times for a new model toy |
|-----------------------------|-------------------|-------------------|-------------------|-----------|-----------|-----------|-----------|
| Element | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    |
| T_c min | 1.0  | 0.5  | 0.8  | 0.3  | 1.2  | 0.2  | 0.5  | 1.5  |
| Immediate processing | ---  | ---  | 1,2  | 2    | 3    | 3,4  | 4    | 5,6,7 |

- Construct the precedence diagram.
- If the ideal cycle is 1.5 mins, what is the theoretical minimum number of stations required to minimize the balance delay?
- Compute the balance delay.

When a vehicle approaches a branching point in which the guide path splits into two (or more) directions, a decision must be made as to which path the vehicle should take. This is sometimes referred to as a decision point for the vehicle. There are two methods used in commercial AGV systems to permit the vehicle to decide which path to take:

1. Frequency select method
2. Path switch select method

In the frequency select method, the guide wires leading into the two separate paths at the branch have different frequencies. As the vehicle enters the decision point, it reads an identification code on the floor to identify its location. Depending on its programmed destination, the vehicle selects one of the guide paths by deciding which frequency to track. This method requires a separate frequency generator for each frequency that is used in the guide path layout. This usually means that two or three generators are needed in the system. Additional channels must often be cut into the floor with the frequency select method to provide for bypass channels where only the main channel needs to be powered for vehicle tracking.

| Table 2: Data of three items are to be processed |
|-----------------|-------------------|-------------------|
| Product | Weekly demand | Production rate (units/h) |
| 1    | 600            | 10                |
| 2    | 1000           | 20                |
| 3    | 2200           | 40                |

Determine the quantity of work focuses required satisfying this demand, given that the plant works 10 shifts for every week and there are 6.5 h available for generation on each work place for each move. The value of nm = 1.

**Arrangement: Table 3: Production of items**

<table>
<thead>
<tr>
<th>Product</th>
<th>Weekly demand</th>
<th>Production Hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>600</td>
<td>600/10</td>
</tr>
<tr>
<td>2</td>
<td>1000</td>
<td>1000/20</td>
</tr>
<tr>
<td>3</td>
<td>2200</td>
<td>2200/40</td>
</tr>
</tbody>
</table>

Total production hours required 165
Since each work focus can operate (10 shifts/week)(6.5 h) or 65 h/week, the total number of work focuses is

\[ W = \frac{165}{65} = 2.54 \text{ work focuses} \]

**Utilization:** Utilization alludes to the amount of yield of a generation facility relative to its capacity. Letting \( U \) speak to utilization, we have

\[ U = \frac{\text{Output}}{\text{Capacity}} \]

**Table 4:** Industrial engineering department has developed time standards based on previous similar jobs

<table>
<thead>
<tr>
<th>No</th>
<th>Element Description</th>
<th>Tek (mins)</th>
<th>Must be preceded by</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Place frame on work holder &amp; clamp</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Assemble plug, grommet to power cord</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Assemble brackets to frame</td>
<td>0.7</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Wire power cord to motor</td>
<td>0.1</td>
<td>1, 2</td>
</tr>
<tr>
<td>5</td>
<td>Wire power to switch</td>
<td>0.3</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>Assemble mechanism plate to brackets</td>
<td>0.11</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>Assemble blade to bracket</td>
<td>0.32</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>Assemble motor to brackets</td>
<td>0.6</td>
<td>3, 4</td>
</tr>
<tr>
<td>9</td>
<td>Align blade &amp; attach to motor</td>
<td>0.27</td>
<td>5, 7, 8</td>
</tr>
<tr>
<td>10</td>
<td>Assemble switch to motor bracket</td>
<td>0.38</td>
<td>5, 8</td>
</tr>
<tr>
<td>11</td>
<td>Attach cover, inspect, &amp; test</td>
<td>0.5</td>
<td>9, 10</td>
</tr>
<tr>
<td>12</td>
<td>Place in tote pan for packing</td>
<td>0.12</td>
<td>11</td>
</tr>
</tbody>
</table>

**Figure 5:** Solutions by Largest Candidate Rule

**IV. CONCLUSION**

In rundown, CIM is a method for utilizing computer systems to coordinate a manufacturing enterprise. The scope of CIM ranges from product design, process design, product scheduling and control, to cutting edge integrated functions inside a production facility. CIM is an inventive and expensive idea to give the arrangements manufacturing industries curve trying to get by in the competitive worldwide market. Today, we are at the threshold of using creative and enhanced computer-related technologies for the advancement of manufacturing industries, contrasted with the circumstance prevailed a decade ago. The successful future of manufacturing industry is inseparably engaged with the proficient and effective utilization of CIM and its segments.
research in CIM and related technologies and the use of it in manufacturing industries are advancing towards a better future. The research should be additionally strengthened towards developing optimized CIM systems to control the scarce assets we are having today to meet the current competitive and agility prerequisites.

**REFERENCE**


