

PART CLASSIFICATION AND CODING IN CELLULAR MANUFACTURING

INTRODUCTION

In **Cellular Manufacturing**, **Part Classification and Coding** is a systematic way to group similar parts into **part families** based on their **design features and manufacturing processes**. This classification helps in forming **manufacturing cells**, reducing setup times, improving efficiency, and standardizing production processes.

1. Part Classification in Cellular Manufacturing

Part classification involves categorizing parts based on common characteristics such as:

- **Geometric features** (shape, size, dimensions)
- **Material type** (metal, plastic, composite)
- **Manufacturing processes** (turning, milling, welding, casting)
- **Functional similarity** (e.g., gears, shafts, brackets)

Methods of Part Classification:

1. Design-Based Classification

- Focuses on the **geometric shape and function** of the part.
- Used in industries where design plays a key role (e.g., aerospace, automotive).

2. Manufacturing-Based Classification

- Groups parts based on **similar production processes** (e.g., machining, stamping, heat treatment).
- Helps in optimizing **machine utilization and tool setup**.

3. Hybrid Classification

- Combines both **design and manufacturing attributes** for comprehensive grouping.
- Used in complex production environments like **CNC machining and flexible manufacturing systems (FMS)**.

2. Part Coding in Cellular Manufacturing

Part Coding assigns a unique **alphanumeric or numerical code** to each part, representing its features and manufacturing processes. This system standardizes part identification and helps in **automation, inventory management, and cell formation**.

Popular Part Coding Systems:

1. Opitz Coding System

- One of the most widely used systems in **Group Technology (GT)**.

- Uses a **9-digit code**, divided into two sections:
 - **Form Code (5 digits):** Describes shape, dimensions, and design.
 - **Supplementary Code (4 digits):** Defines manufacturing and material attributes.
- Example: **22345-6789** (Each number represents a design or process characteristic).

2. MICLASS System

- A modular coding system used across **multiple industries**.
- Uses a hierarchical structure to categorize parts based on **design, manufacturing, and functional characteristics**.

3. DCLASS System

- Focuses on **design-based classification**.
- Suitable for industries where **product shape and features dominate manufacturing decisions**.

4. CUT (Code Universel de Traitement)

- Used for **machined parts**.
- Emphasizes **tooling and processing information**.

3. Benefits of Part Classification and Coding in Cellular Manufacturing

- ✓ **Efficient Cell Formation:** Groups similar parts together, optimizing **machine utilization**.
- ✓ **Reduced Setup & Changeover Time:** Standardized processes minimize **tool changes** and **machine adjustments**.
- ✓ **Improved Production Planning:** Helps in scheduling jobs, managing inventory, and reducing **work-in-progress (WIP)**.
- ✓ **Automation & Computer-Aided Manufacturing (CAM):** Supports CNC programming and **automated retrieval of process data**.
- ✓ **Cost Reduction:** Streamlined production leads to **lower material handling and storage costs**.

4. Example of Part Classification and Coding in a Manufacturing Cell

A factory producing **mechanical components** (shafts, gears, and brackets) may classify parts as follows:

Part	Shape	Material	Process	Code (Opitz Example)
Gear	Cylindrical	Steel	Turning, Heat Treatment, Finishing	22345-6789
Shaft	Long & Round	Aluminum	Turning, Grinding	11234-5678
Bracket	Flat & Angular	Mild Steel	Stamping, Welding, Painting	33412-6789

Each part is assigned a unique **code** based on its features and manufacturing requirements. This helps in **machine grouping, scheduling, and resource allocation** within **manufacturing cells**.