

Introduction of material management-

The wealth of a country is measured by its gross national product—the output of goods and services produced by the nation in a given time. Goods are physical objects, something we can touch, feel, or see. Services are the performance of some useful function such as banking, medical care, restaurants, clothing stores, or social services. But what is the source of wealth? It is measured by the amount of goods and services produced, but where does it come from? Although we may have rich natural resources in our economy such as mineral deposits, farmland, and forests, these are only potential sources of wealth. A production function is needed to transform our resources into useful goods. Production takes place in all forms of transformation— extracting minerals from the earth, farming, lumbering, fishing, and using these resources to manufacture useful products. There are many stages between the extraction of resource material and the final consumer product. At each stage in the development of the final product, value is added, thus creating more wealth. If ore is extracted from the earth and sold, wealth is gained from our efforts, but those who continue to transform the raw material will gain more and usually far greater wealth. Japan is a prime example of this. It has very few natural resources and buys most of the raw materials it needs. However, the Japanese have developed one of the wealthiest economies in the world by transforming the raw materials they purchase and adding value to them through manufacturing. Operations management works in a complex environment affected by many factors. Among the most important are government regulation, the economy, competition, customer expectations, and quality. Government. Regulation of business by the various levels of

government is extensive. Regulation applies to such areas as the environment, safety, product liability, and taxation. Government, or the lack of it, affects the way business is conducted. Economy. General economic conditions influence the demand for a company's products or services and the availability of inputs. During economic recession the demand for many products decreases while others may increase. Materials and labor shortages or surpluses influence the decisions management makes. Shifts in the age of the population, needs of ethnic groups, low population growth, freer trade between countries, and increased global competition all contribute to changes in the marketplace. Competition. Competition is severe today. • Manufacturing companies face competition from throughout the world. They find foreign competitors selling in their markets even though they themselves may not be selling in foreign markets. Companies also are resorting more to worldwide sourcing. • Transportation and the movement of materials are relatively less costly than they used to be.

Material handling

Material handling may be considered a specialized activity for modern manufacturing units. From the time, the input material or raw materials enter the industrial unit and go out of the unit in the form of finished products, these are handled at all stages in between, no matter, on the shop floor or in the stores.

It has been estimated that the average material handling cost is roughly 30 to 60% of the cost of production. This is so since majority of production time is consumed in handling materials before, during and

after the manufacture. However, this cost can be reduced by proper selection, operation, maintenance and layout of material handling devices but cannot be totally eliminated. The four main categories of material handling equipment include storage, engineered systems, industrial trucks, and bulk material handling.

Storage and Handling Equipment

Storage equipment is usually limited to non-automated examples, which are grouped in with engineered systems. Storage equipment is used to hold or buffer materials during “downtimes,” or times when they are not being transported. These periods could refer to temporary pauses during long-term transportation or long-term storage designed to allow the buildup of stock. The majority of storage equipment refers to pallets, shelves or racks onto which materials may be stacked in an orderly manner to await transportation or consumption. Many companies have investigated increased efficiency possibilities in storage equipment by designing proprietary packaging that allows materials or products of a certain type to conserve space while in inventory.

Examples of handling equipment include:

- **Racks**, such as pallet racks, drive-through or drive-in racks, push-back racks, and sliding racks, are a basic but important method of storage, saving floor space while keeping their contents accessible.
- **Stacking frames** are stackable like blocks, as their name implies. They allow crushable pallets of inventory, such as containers of liquid, to be stacked to save space without damage.
- **Shelves, bins, and drawers**. Shelves, another basic storage method, are less open than racks. Used with bins and drawers, they're more able to keep smaller and more difficult to manage materials and products stored and organized. Shelving types can include boltless, cantilever, revolving, and tie-down.

- **Mezzanines**, a type of indoor platform, help to create more floor space in a warehouse or other storage building for offices or more storage. Typical types include modular, movable, rack supported, building supported, and free-standing versions.
- **Work assist tooling** enables safe and efficient product handling across numerous industries in applications that require the movement of products, enhancing the efficiency of assembly and manufacturing operations.

Engineered Systems

Engineered systems cover a variety of units that work cohesively to enable storage and transportation. They are often automated. A good example of an engineered system is an Automated Storage and Retrieval System, often abbreviated AS/RS, which is a large automated organizational structure involving racks, aisles and shelves accessible by a “shuttle” system of retrieval. The shuttle system is a mechanized cherry picker that can be used by a worker or can perform fully automated functions to quickly locate a storage item’s location and quickly retrieve it for other uses.

Other types of engineered systems include:

- **Conveyor systems** come in a variety of types, depending on what they are meant to transport, including vibrating, overhead, chain, vertical, and apron conveyors.
- **Automatic Guided Vehicles (AGV)** are independent computer-operated trucks that transport loads along a predetermined path, with sensors and detectors to avoid bumping into anything.

Industrial Material Handling Trucks

Industrial trucks (material handling trucks) refer to the different kinds of transportation items and vehicles used to move materials and products in materials handling. These transportation devices can include small hand-operated trucks, pallet jacks, and various kinds of forklifts. These trucks

have a variety of characteristics to make them suitable for different operations. Some trucks have forks, as in a forklift, or a flat surface with which to lift items, while some trucks require a separate piece of equipment for loading. Trucks can also be manual or powered lift and operation can be walk or ride, requiring a user to manually push them or to ride along on the truck. A stack truck can be used to stack items, while a non-stack truck is typically used for transportation and not for loading.

There are many types of industrial trucks:

- **Hand trucks**, one of the most basic pieces of material handling equipment, feature a small platform to set the edge of a heavy object on, and a long handle to use for leverage. Whatever is being moved must be tipped so that it rests on the handle, and is carried at a tilt to its destination.
- **Pallet Trucks**, also known as pallet jacks, are a type of truck specifically for pallets. They slide into a pallet and lift it up to move it. Pallet trucks come in both manual and electrical types.
- **Walkie Stackers** transport and lift pallets like a forklift, though they don't include a place for the operator to ride in. They come in both powered or manual versions.
- **Platform trucks** are hand trucks low to the ground, with a wide platform for transporting goods.
- **Order pickers** lift the operator several feet above the ground on a platform so they can retrieve or store goods on high shelves.
- **Sideloaders**, also known as VNA (Very Narrow Aisle) trucks, are meant to fit in narrow warehouse aisles, as they can load objects from different directions. They're also good for long, awkward products that need moving.
- **Many types of AGV**, or automatic guided vehicles, as discussed above, shuttle products along a route automatically, without human guidance. See more on trucks and carts in our other [Thomas' Buying Guide: Types of Trucks and Carts](#).

Bulk Material Handling Equipment

Bulk material handling refers to the storing, transportation and control of materials in loose bulk form. These materials can include food, liquid, or minerals, among others. Generally, these pieces of equipment deal with the items in loose form, such as conveyor belts or elevators designed to move large quantities of material, or in packaged form, through the use of drums and hoppers.

- **Conveyors**, as mentioned above, come in a wide variety of types for different types of bulk material.
- **Stackers**, which are usually automated, pile bulk material onto stockpiles, moving between two points along rails in a yard.
- **Reclaimers** are the opposite of stackers, retrieving materials from stockpiles, some using bucket wheels to carry the material while others are scraper or portal style.
- **Bucket elevators**, also known as grain legs, use buckets attached to a rotating chain or belt to carry material vertically.
- **Grain elevators** are tall buildings specifically for storing grain. They include equipment to convey the grain to the top of the elevator, where it is sent out for processing.
- **Hoppers** are funnel-shaped containers that allow material to be poured or dumped from one container to another. Unlike a funnel, though, hoppers can hold material until it's needed, then release it.
- **Silos** are generally large storage structures for bulk materials, though they don't necessarily include equipment to convey the material to the top of the structure like grain elevators. Different varieties include tower, bunker, and bag silos.

Inventory management

Inventory management is a systematic approach to sourcing, storing, and selling inventory—both raw materials (components) and finished goods (products).

In business terms, inventory management means the right stock, at the right levels, in the right place, at the right time, and at the right cost as well as price.

Inventory management types

Typically, inventory types can be grouped into four categories: (1) raw materials, (2) works-in-process, (3) finished goods, and (4) maintenance, repair, and operations (MRO) goods.

1. **Raw materials** are any items used to manufacture components or finished products. These can be items produced directly by your business or purchased from a supplier. For example, a candle-making business could purchase raw materials such as wax, wicks, and decorative ribbons.
2. **Works-in-progress inventory** refers to unfinished items moving through production but not yet ready for sale. In the case of a candle-making business, work-in-progress inventory might be candles that are drying and unpackaged.
3. **Finished goods** are products that have completed the production process and are ready to be sold: the candles themselves.
4. **Maintenance, repair, and operations (MRO) goods** are items used to support and facilitate the production of finished goods. These items are usually consumed as a result of the production process but aren't direct part of the finished product. For instance, disposable molds used to manufacture candles would be considered MRO inventory.

