Bringing a New Car to Market 6a

Manufacturing Planning

Jim Rauf

Steps in Bringing a New Car to Market

Introduction

A little history

Automobile industry

Product Planning-Market Analysis & Identification of Opportunities

Understand market trends, consumer preferences, emerging technologies and government regulations

Analyze competitors - identify gaps in the market for new car

Concept and Design

Translate market insights into conceptual ideas for a new car

Collaborate with design teams and engineers to develop innovative and appealing vehicle concepts

Engineering and Development

Design the vehicle - safety, performance, and efficiency

Extensive testing - prototype testing, crash testing, emissions testing and performance testing

Address any design or engineering challenges that arise during the development phase

Regulatory Compliance

Demonstrate safety , emissions, mileage compliance

Certify models' configurations

BEV mandates

Manufacturing Planning:

Manufacturing plan - consider production volume, assembly processes, and quality control

Identify component suppliers establish partnerships

Set up manufacturing facilities and production lines

Production and Quality Control:

Begin production - ensure adherence to quality standards and specifications

Implement quality control measures - identify and address manufacturing defects

Conduct pre-launch inspections and testing - guarantee the reliability and safety of the vehicles

Launch and Distribution

Marketing campaigns to generate excitement and drive sale

Coordinate with dealerships and distributors to ensure a smooth rollout

Monitor customer feedback - address post-launch issues

2023 Car Manufacturers R&D Spending

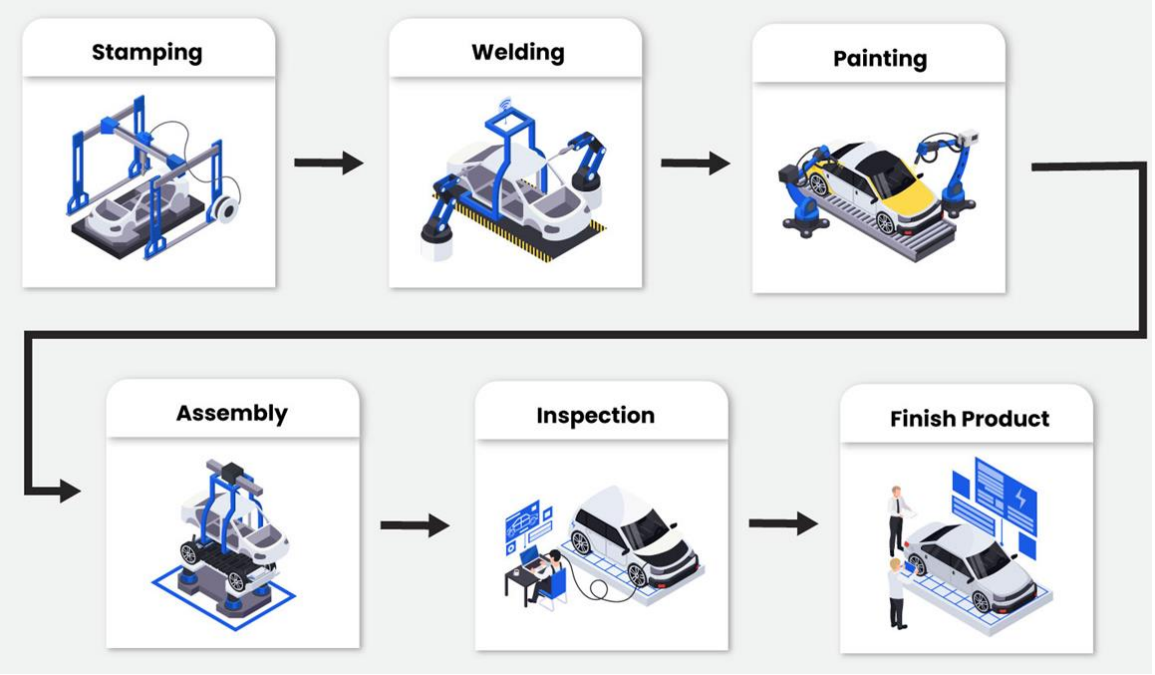
- **VW** $23.6 billion
  - It has a lot of brands to support
- **BMW** $12.7 billion
  - Developing Neue Klasse of electric cars
- **Mercedes** $10.8 Billion
- **GM** $9.9 billion
- **Ford** $8.2 billion
- **Toyota** $7.6 billion
- **Honda** $6.1 Billion
- **Stellantis** $6.0 Billion
- **BYD** $5.4 billion
- **Tesla** $3.9 Billion
- **Hyundai** not in the top ten

BMW Assembly Plant Spartanburg S.C.

Manufacturing Planning

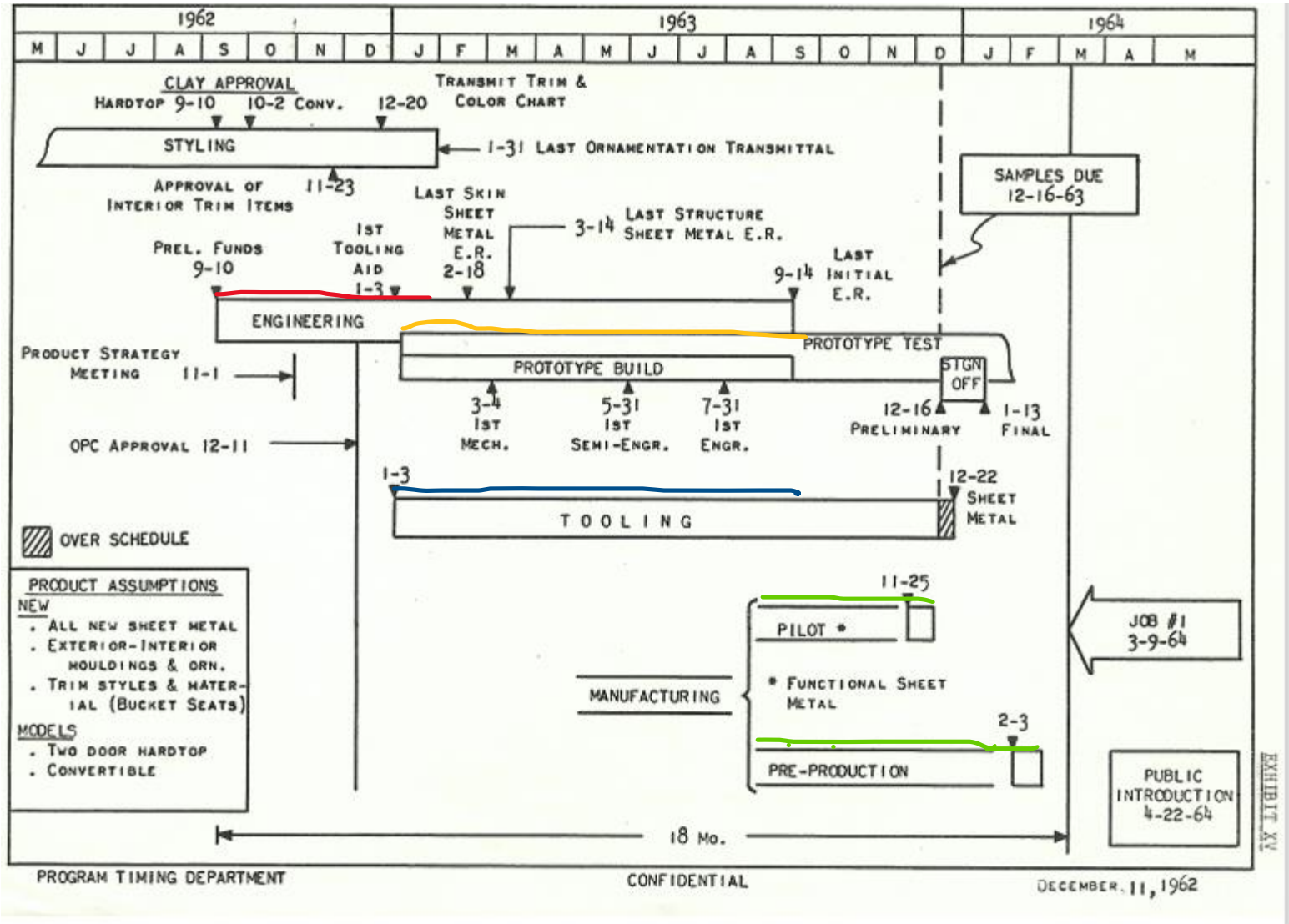
- Like much of the activities involved in bringing a new car to market , manufacturing planning is a **collaborative** effort
- Manufacturing , sourcing , engineering , styling , product planning , human resources , and marketing are all involved
- The goal of manufacturing planning is to **optimize** the manufacturing process
- To make it as **efficient** as possible
- To minimize the **manufacturing costs**
- To maximize the net **revenue** and **return on investment**
- To produce vehicles that **satisfy** customers

Major Steps in Car Manufacturing



Manufacturing Planning

Program Overlaps



Manufacturing Planning Elements

- **Capacity Planning**:
- Determine the production capacity required to meet expected demand
- Demand determined by Product Planning and Marketing
- **Resource Allocation**:
- Identify and allocate necessary resources
- New factory?
- Machinery
- Equipment
- Workforce
- Automation versus workers

- **Production Scheduling**:
- Create a **detailed** production schedule
- Aligns with project timelines
- Meets production demands
- Shifts required?
- Overtime?

Manufacturing Planning Elements

- **Supply Chain Management**
- Identify, evaluate, and select **suppliers** for **materials** and **components**
- **Procurement Planning**:
- Establish procurement processes and negotiate contracts with suppliers
- **Logistics Planning**:
- Plan logistics for **timely delivery** of materials and components to the production site

Hierarchical Model to Decide Whether to Outsource or Not

- **Customer Importance**
  - How important is the component to the customer?
  - What is the impact of the component on customer experience?
  - Does the component affect customer choice?
- **Component Clockspeed**
  - How fast does the component's technology change relative to other components in the system?
- **Competitive Position**
  - Does the firm have a competitive advantage producing this component?
- **Capable Suppliers**
  - How many capable suppliers exist?
- **Architecture**
  - How modular or integral is this element to the overall architecture of the system?

Manufacturing Planning Elements

Outsourcing Decisions at Toyota

- About 30% of components in-sourced
- Engines:
  - Company has knowledge and capacity
  - 100% of engines are produced internally
- Transmissions
  - Company has the knowledge
  - Designs all the components
  - Depends on its suppliers' capacities
  - 70 % of the components outsourced
- Vehicle electronic systems
  - Designed and produced by Toyota's suppliers.
  - Company has dependency on both capacity and knowledge

Manufacturing Planning Outsourced Parts Toyota

Air Intake Filters: These components ensure clean air reaches the engine for optimal combustion efficiency

Air Suspension: Used for a smoother ride and adjustable ride height

Blow Off Valves: Essential for turbocharged engines to release excess pressure

Boost Controllers: Regulate turbocharger boost levels

Brake Accessories: Including brake lines, hoses, and fittings

Brake Kits: Consisting of rotors, pads, and calipers

Catalytic Converters: Control emissions

Control Arms: Connect suspension components

Electronics: Various sensors, modules, and control units

Exhausts: Enhance performance and sound

Fuel Delivery: Fuel pumps, injectors, and lines

Suspension Bushings: Dampen vibrations and improve handling

Coilovers: Adjustable suspension systems

Cold Air Intakes: Increase airflow to the engine

Intercoolers: Cool compressed air before entering the engine

Oil Cooler Kits: Maintain optimal oil temperature

Radiators: Keep the engine cool

Shocks: Dampen suspension movement

Throttle Bodies: Control airflow into the engine

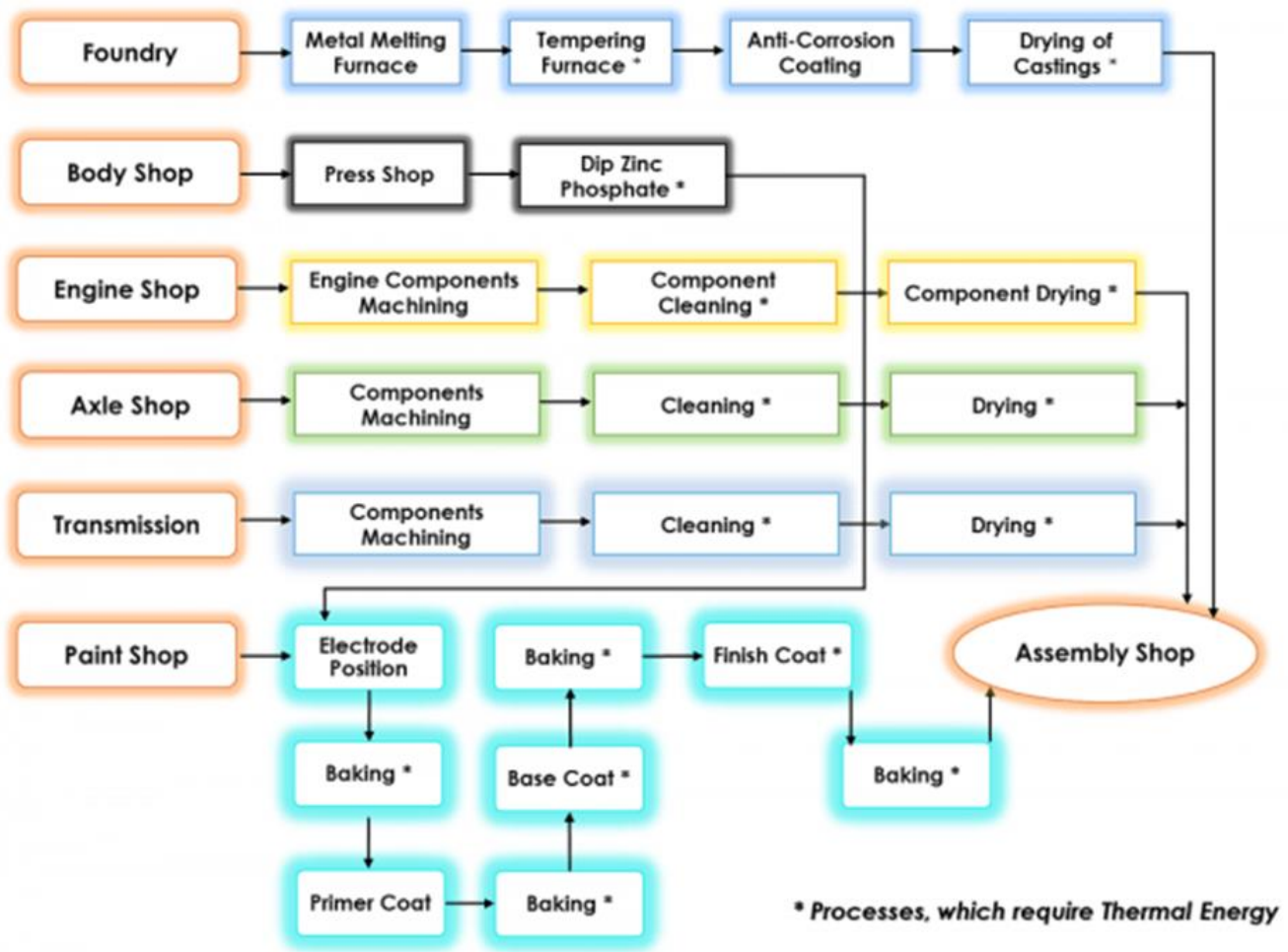
Turbo Kits & Parts: Boost engine power

Wheels: Often sourced from specialized wheel manufacturers

Manufacturing Planning Outsourced Parts BMW

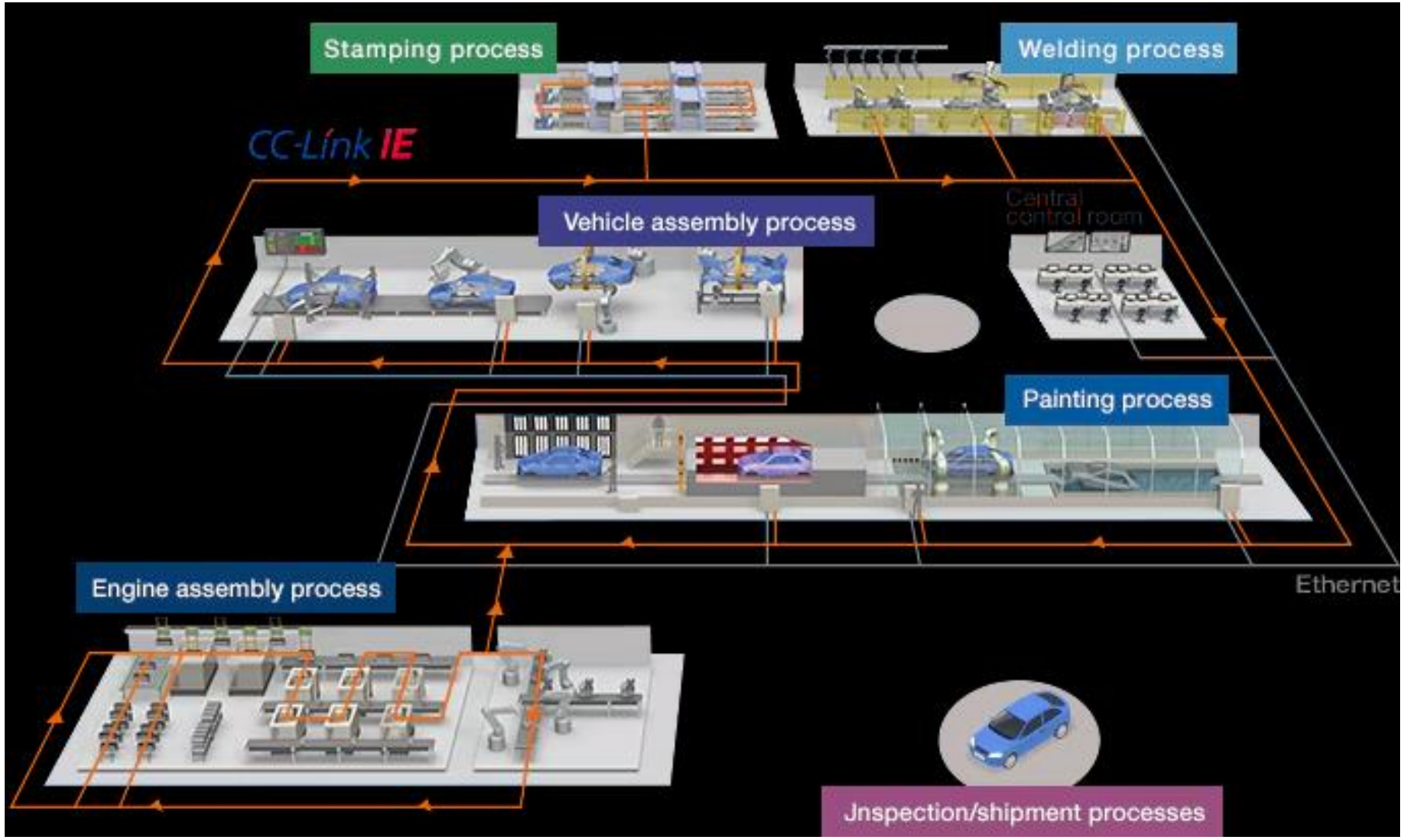
Manufacturing Planning Process Design

- **Manufacturing Process Design**
- **Process Flow Design**:
- Develop detailed process flows and assembly line layouts
- **Technology and Equipment Selection**:
- Choose appropriate manufacturing technologies and equipment
- Order new equipment
- Modify existing equipment
- **Quality Assurance**:
- Implement quality control measures and testing procedures to ensure product quality.



Schematic Flow Diagram in Automobile Industry

Manufacturing Planning Process Design



Manufacturing Planning Process Design

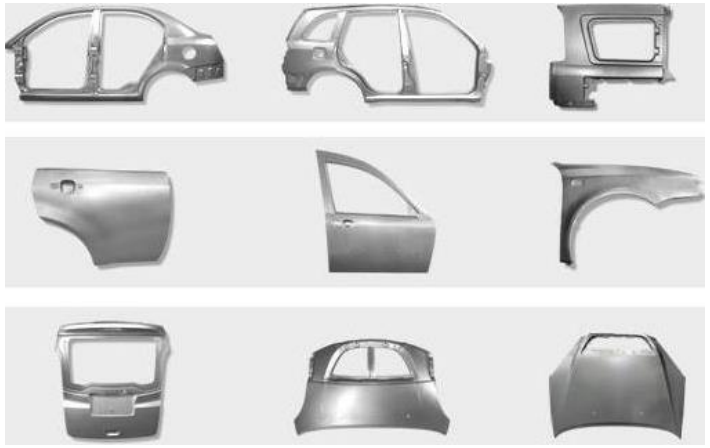
Manufacturing Planning Process Design

Secure delivery schedules for outsourced parts

- Just in time delivery
- Adequate inventory
- Ramp up to full production

Stamping

- 01 Steel coils are received from suppliers
- 02 Steel is cut into blanks
- 03 Steel blanks are “pressed” into shapes for body parts



Manufacturing Planning Process Design

Welding

- 04/05 Various steel sheet shapes are welded together to form car body
- 06 Steel shapes are welded to form doors
- 07 Inspections are performed

Manufacturing Planning Process Design

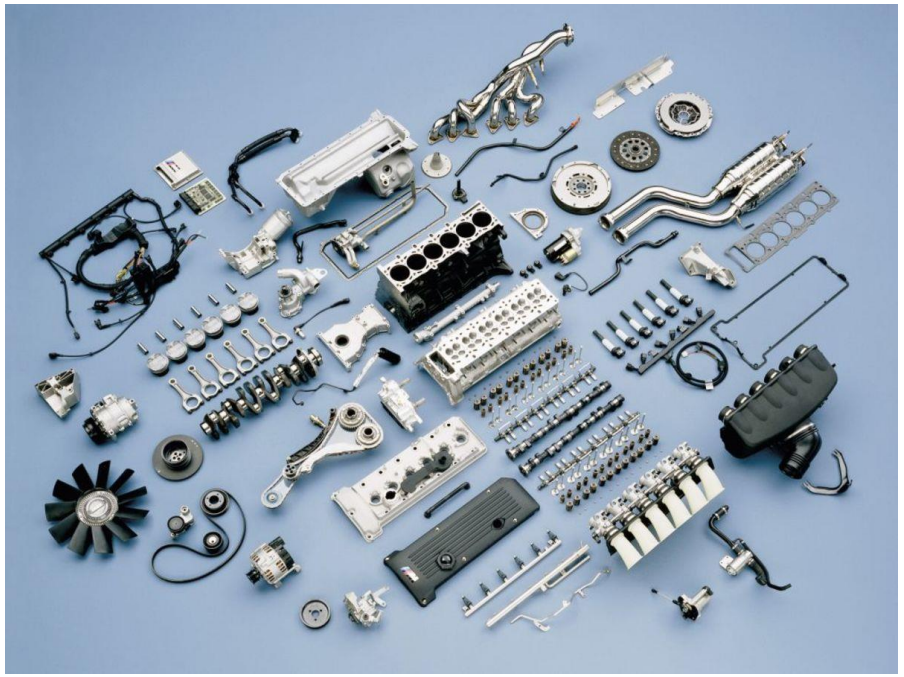
Painting

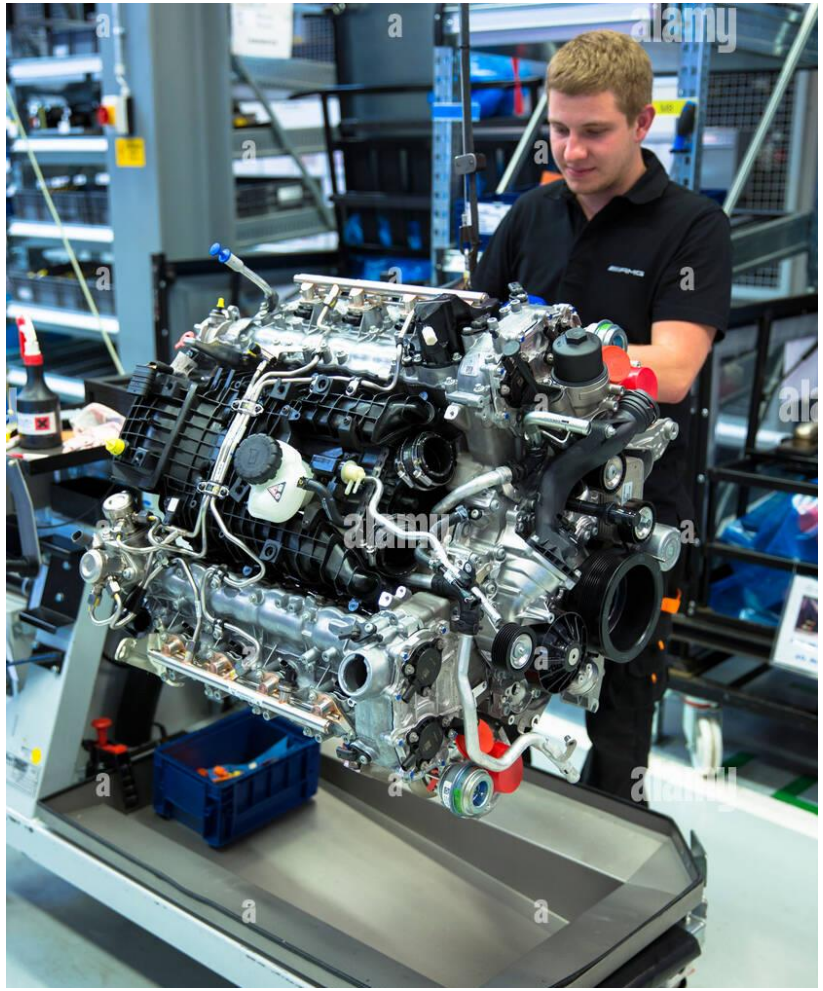
- 08 Body is electrodeposition coated
- 09 Sealer application
- 10 Finish coating applied
    - Bodies painted in batches
- 11 Paint is inspected
- Doors removed
- Sent to Door assembly line

Manufacturing Planning Process Design

Engine assembly

- 12 Engine casting
- 13 Engine machining
- 14 Engine heat treated
- 15 Engine components assembled (supplier)





Manufacturing Planning

Parts of IC Engines Commonly Outsourced

Engine Block and Cylinder Head

The raw casting of engine blocks and cylinder heads is often outsourced to foundries specializing in high-precision casting techniques.

Pistons and Connecting Rods

Crankshaft and Camshaft

The forging, machining, and heat treatment of crankshafts and camshafts

Valves and Valve Springs

These components require precise metallurgy and manufacturing

Fuel System Components

Fuel Injectors and fuel pumps

Engine sensors

Turbochargers and Superchargers

Ignition System Components

Spark Plugs and ignition coils

Bearings and Bushings

Cooling System Components

Radiators , Water Pumps and thermostats

Lubrication System Components

Oil Pumps and Oil Filters

Exhaust System Components

Catalytic Converters and Exhaust Manifolds

Gaskets and Seals

Transmissions and gears

Manufacturing Planning Process Design

Vehicle assembly

Body on assembly line

- **16 Instrument panel installed (supplier)**
- 17 Glass installed (supplier)
- 18 Bumpers installed
- 19 Engine installed
- 20 Seats installed (supplier)
- 21 Tires mounted (supplier)
- 22 Doors installed

Manufacturing Planning Process Design

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- **22 Doors installed**
- **23-25 Inspections**
- **26 Shipment**

Manufacturing Planning Pilot Production and Testing

Pilot Production Run:

- Conduct a limited production run to validate the manufacturing process
- Identify and correct problems
- **Testing and Validation**:
- Perform extensive testing on pilot vehicles to ensure they meet all specifications and standards
- Meet quality goals

Feedback Integration:

- Collect feedback from testing and make necessary adjustments to the production process

Final Preparations:

- Finalize all production plans, schedules, and resource allocations
- Fix problems found in Pilot Production runs

Staff Training:

- Train production staff on new processes, equipment, and quality standards

Production Ramp-Up:

- Gradually increase production volume while monitoring quality and efficiency
- Make changes as necessary

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