## The Complete Book on Production of Automobile Components & Allied Products

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The Complete Book on Production of Automobile Components & Allied Products (Engine Parts, Piston, Pin, Piston Ring, Valve, Control Cable, Engine Mounting, Auto Lock, Disc Brake, Drum, Gear, Leaf Spring, Shock Absorber, Silencer, Chain, Cylinder Block, Chassis, Battery, Tyre & Flaps)

The rapid urbanization, coupled with an overwhelming growth in the middle class population, has created a market that is extremely conducive for the automobile industry to flourish. It is inferred from the demand, the investment in the automobile industry is estimated at over hundredths of billions in the vehicles and auto components segment. The auto market is thought to be made primarily of automakers, but auto parts makes up another lucrative sector of the market. The major areas of auto parts manufacturing are: Original Equipment Manufacturers (OEMs) - The big auto manufacturers do produce some of their own parts, but they can't produce every part and component that goes into a new vehicle; Replacement Parts Production and Distribution - These are the parts that are replaced after the purchase of a vehicle. The book provides a characterization of vehicles, including structure, load, fuel used, requirement of various components, fabrication and so on. It will prove to be a layman's guide and is highly recommended to entrepreneurs, existing units who wants to diversify in production of automobile and allied products, research centers, professionals and libraries, as it contains information related to manufacturing of integral parts of an automobile and practices followed in the finishing of the products.

The topics covered in the book are: Classification of vehicles on the basis of load, fuel used and their parts; Material used in the manufacturing of automobile (Metals, Alloys, Polymers etc.); Technology used; Use of Aluminium in Automobiles; Use of Plastics in Automobiles; Manufacturing practices for Engine Parts(Auto Piston, Pins, Piston ring, Lead Storage Battery, Valve & Valve Seat, Automobile Silencer, Automobile Chain, Cylinder Block, Automobile Control Cable, Engine Mounting PAD, Auto Locks etc.); Manufacturing of Automobile Chassis, Disc Brake, Brake Drum, Gear, Gear Blank, Leaf Spring, Shock Absorbers, Automobile Tyres; Heat Treatment System for Automobile Parts; Forging Technology (Open Die Forging Process, Close Die Forging Process, Designing of forged parts) and Painting Technology(Conversion Coating, NAD Finishes, Aluminium Flake Orientation, Opacity, Gloss, Electro Powder Coating, Spot Repair, Electrostatic Spray etc.) for automobile parts; Scab Corrosion Test, Peel Resistance.

Classification of Vehicles

On the Basis of Load

Wheels

Fuel Used

Body

**Transmission** 

Position of Engine

Engine in Front

Engine in the Rear Side

Layout of an Automobile Chasis

Components of the Automobile

Functions of Major Components of an Automobile

Chasis and Frame

**Engine or Power Plant** 

Transmission System (Clutch and Gear Box)

Clutch

Final Drive

**Braking System** 

Gear Box

Steering System

Front Axle

Suspension System

## 2. MATERIALS USED IN AUTOMOBILES

Introduction

Requirements of the Materials in Automotive

Lightweight

Cost

Safety, Crashworthiness

Crashworthiness Tests

Frontal Offset Crash Test Details

Side Impact Crash Testing/Ratings Criteria

Rollover Evaluations

Recycling and Life Cycle Considerations

Current Materials in Use and Their Future

Metals

Steel

New Grades of Steel and Alloys

a. Duplex Austenitic-ferritic Stainless Steel

b. Austenitic Stainless Steel

Advances in Manufacturing and Joining Technique

Aluminium

Aluminium Alloys for Body-in-white Applications

Aluminium Alloys for Brazing Sheet Applications

Magnesium

Mechanical Properties of Mg Alloys

Technical Problems and Solutions for Use of Magnesium Alloys in Automotive Industry

Plastics and Composites

**Fabrication** 

Cost

Manufacturability

Design Data/Test Methodologies

Joining and Inspection

Renewable Materials, Barriers and Incentives in Use of Biocomposites

Thermoplastic/Thermoset Polymers

Composite Processing

3. MATERIALS AND TECHNOLOGY FOR

**AUTOMOBILES** 

Introduction

Steel Sheets

High Strength Steel Sheets

New Precipitation-hardened High Strength Hot Rolled Steel Sheet "NANO-Hiten"

New High Strength Hot Rolled Steel Sheet for Strain Aging Use "BHT"

High Strength Galvannealed Steel Sheets

(1) SFG Hiten

(2) Low Carbon Equivalent Type Hiten

High Formability Ultra-high Strength Cold Rolled steel Sheets

High Carbon Steel Sheets with High Formability

**Coated Steel Sheets** 

Coated Steel Sheets with High Lubrication for Automotive Use

- (1) Development of Inorganic Type High Lubrication Galvannealed Steel Sheets
- (2) Organic Solid Lubricant Technology
- (3) Summary

Hot Dip Galvanized Steel Sheet with Excellent Surface Appearance

- (1) Improvement of Surface Appearance
- (2) Surface Roughness Transfer Technologies and Frictional Properties
- (3) Summary

Evaluation and Application Technologies for Automotive Steel Materials

Tailor Welded Blanks

Application Technologies of Hydroforming

Application Technologies for High Strength Steel Sheets in Press Forming

Application of CAD-CAE Systems

High Frequency Electrical Materials for Cars of the Future "Super-Core"

Features of JFE Steel's Super-Core

**JNEX** 

**JNHF** 

**Automotive Applications** 

Stationary Equipment

**Rotating Machinery** 

Other Electrical Applications

Summary

Ferritic Stainless Steels for Automobile Exhaust System Parts

Steels for Mufflers

Steels for Exhaust Manifolds

Steels for Catalytic Converter Substrate

Steel Tubes

**HISTORY Tube** 

High Formability ERW Tubes for Automotive Use

Stainless Steel Tubes for High Temperature Service in Automotive Exhaust Systems

Bar Products for Automotive Use

Bearing Steels "NKJ", "KUJ7"

Graphite Steel "HFC1 Steel"

BN Free Cutting Steel "CCBN Steel"

High Surface Durable Carburized Dual-phase Steel

High Toughness Microalloyed Steel for Hot Forging

Warm Compaction Method with Die Wall Lubrication for Iron Powder Metallurgy

Lightweight Composite Material for Automotive Headliner "KP Sheet"

## 4. USE OF ALUMINIUM IN AUTOMOBILES

Introduction

Aluminium in Automobile

Advantages

Disadvantages

Space Frame Technology

Sand Casting

Al-Si Alloys

**Grain Refinement** 

Modification

Extrusion

Al-Si-Mg Alloys

Moment of Inertia

**Heat Treatment** 

Solutionizing

Aging

Annealing

**Exposed Loads on Chassis** 

Static Loads

Dynamic Loads

**Fatigue** 

Welding

Stress Corrosion Cracking

Sand Casting

**Spiral Fluidity Test** 

Mechanical Properties of A356.0 and Silafont - 36

Mechanical Properties Change with Heat Treatment

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**Technology Activities and Priorities** 

6. MANUFACTURING OF ENGINE PARTS

1. Manufacturing of Auto Piston

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Market Potential

Basis and Presumptions

Implementation Schedule

Preparation of Project Report

**Technical Aspects** 

Process of Manufacture

**Quality Control and Standards** 

**Production Capacity** 

**Pollution Control** 

2. Manufacturing of Pins for Automobiles

Introduction

**Market Potential** 

Production Target (per Annum)

Basic & Presumptions

Implementation Schedule

**Technical Aspects** 

3. Manufacturing of Piston Ring

Introduction

Market Potential

**Basis and Presumptions** 

Implementation Schedule

**Technical Aspects** Material **Quality Control Pollution Control** Introduction

Manufacturing Process

Piston Ring Coatings

**Power Consumption** 

4. Manufacturing of Lead Storage Battery

Market Potential

**Basis & Presumptions** 

Implementation Schedule

**Technical Aspects** 

I. Process of Manufacture

**Process Flow Chart** 

II. Quality Control & Standard

III. Production Capacity (Per Annum)

IV. Motive Power Required

V. Pollution Control Requirements

VI. Energy Conservation

Lighting

Additional Information

5. Manufacturing of Valve and Valve Seat

Introduction

Methodology

**Material Selection** 

**Exhaust Valve** 

Criteria of Exhaust Valve

**Chemical Analysis** 

**Mechanical Properties** 

**Physical Properties** 

**Exhaust Valve Seat Insert** 

Criteria for Material Selection of Engine Valve Seat Insert

Extrusion

**Process Selection** 

**Exhaust Valve** 

Flow Processes

Friction Welding

Upsetting

Steps

**Forging** 

**Heat Treatment** 

Advantages

Steps

Stellite Deposition

Advantages

**Head Diameter Facing** 

**Groove CNC Turning** 

Tip Hardening

Advantages

**Neck Profile Turning** 

**Seat Grinding** 

Surface Finishing

Advantages

**Alternative Process** 

**Alternative Process** 

**Exhaust Valve Seat Insert** 

Flow Processes

**Investment Casting** 

Steps

Surface Finishing

Steps

Wear Resistance Treatment

Ferritic Nitrocarborizing

Advantage

Steps

6. Manufacturing of Automobile Silencer

Introduction

Market Potential

Basis and Presumptions

Implementation Schedule

**Technical Aspects** 

**Process of Manufacture** 

Quality Control and Standards

**Pollution Control** 

**Energy Conservation** 

7. Manufacturing of Automobile Chain

Introduction

Market Potential

**Basis and Presumptions** 

Implementation Schedule

**Technical Aspects** 

**Process of Manufacture** 

**Quality Control and Standards** 

Production Capacity (per annum)

**Pollution Control** 

**Energy Conservation** 

8. Manufacturing of Cylinder Block

Introduction

Description of the Product

What is an Engine Block?

Functional Requirements of a Cylinder Block

Required Material Properties

Metals Used in the Manufacture of the Cylinder Blocks

Manufacturing the Cylinder Block

Mechanical Properties of the Alloys

**Gray Cast Iron Alloys** 

Compacted Graphite Cast Iron

**Aluminium Alloys** 

Magnesium Alloys

**Casting Processes** 

Green Sand Molding

Lost Foam Casting

Market Potential

**Basis and Presumption** 

Implementation Schedule

**Technical Aspect** 

Manufacturing Process

Alternate Technology

**Production Targets** 

**Quality Control and Standards** 

Utilities

**Energy Conservation** 

**Pollution Control** 

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Introduction

Production Capacity: 45000 Per Annum

Market & Demand Aspects

Manufacturing Process & Source of Technology

Basis of Project Preparation and Technical Aspects

Presumption

Implementation Schedule

**Quality Control & Standards** 

**Pollution Control** 

10. Manufacturing of Automobile Control Cable

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**Basis and Presumptions** 

**Technical Aspects** 

**Process of Manufacture** 

Implementation Schedule

**Process Flow Chart** 

**Quality Control and Standards** 

Motive Power

Pollution Control

11. Manufacturing of Engine Mounting PAD

Introduction

Market Potential

**Basis and Presumptions** 

Implementation Schedule

**Technical Aspects** 

**Process of Manufacture** 

12. Manufacturing of Auto Locks

Project Profile on Casting for Auto Locks

Part - II

Introduction

Market Potential

**Basis & Presumptions** 

Implementation Schedule

**Technical Aspects** 

**Process of Manufacture** 

**Quality Control and Standards** 

Pollution Control

**Energy Conservation** 

7. MANUFACTURING OF AUTOMOBILE CHASSIS

1. Manufacturing of automobile Body

Automobile Body Manufacturing Processes

**BIW Manufacturing Processes** 

Blanking and Stamping Processes

Subassembly Processes and Major subassemblies of a BIW

**Body Framing Process** 

**Door Manufacturing Processes** 

Rolling and Blanking Processes

Stamping Process

Door Hanging and Fitting Process

**Door Hanging Process** 

Door Fitting

Market Potential

**Basis and Presumptions** 

Implementation Schedule

**Technical Aspects** 

Process of Manufacture

**Pollution Control** 

**Energy Conservation** 

2. Manufacturing of Disc Brake

Introduction

Grey Cast Iron as Material for Production of Disc Brake

Aluminium as the Material for the Holder

Manufacturing Process of DISC Brake and Holder

**Cold Chamber** 

Hot Chamber

Heat Treatment for Holder

- i. Cooling Rate
- ii. Shrinkage
- a. Volumetric Shrinkage
- b. Linear Shrinkage

**Finishing Process** 

Driving the Lathe

Holding and Rotating the Work

Holding, Moving and Guiding the Cutting Tool

For Disc Brake

For the Holder

Methodology

Summary

3. Manufacturing of Brake Drum

Introduction

Market Potential

Basis and Presumptions

Implementation Schedule

**Technical Aspects** 

**Process of Manufacture** 

Quality Control and Standards

Production Capacity (per annum)

Pollution Control

4. Manufacturing of Gear Blank

Introduction

Market and Demand Aspects

Raw Materials

Manufacturing Process

The Process of Flow Chart

5. Manufacturing of Gear

Introduction

Materials Used in Gear Manufacturing Process

Classification of Gears

- 1. Milling Process
- 2. Gear Planning Process
- 3. Gear Shapers
- 4. Gear Hobbing
- 5. Bevel Gear Generating

Gear Manufacture by Casting Method

Methods of Forming Gears

**Roll Forming** 

Stamping

**Powder Metallurgy** 

Extrusion

**Gear Generating Process** 

Gear Hobbing

Type of Hobbing

**Arial Hobbing** 

Radial Hobbing

**Tangential Hobbing** 

Gear Shaping (The Fellows Process)

Rack - Type Cutter Generating Process

Pinion Type Cutter Generating Process

Advantages

Disadvantages

Gear Cutting by Milling

Disc Type Cutter

**End Mill Cutter** 

Advantage

Used

**Bevel Gear Generating** 

Straight Bevel - Gear Generator

Spiral Bevel - Gear Generator

Gleason Method

**Templet Gear Cutting Process** 

**Gear Finishing Process** 

Gear Shaving

Gear Grindings

Disadvantage

Gear Lopping

**Shot Blasting** 

**Phosphate Coating** 

Gear Planning

The Sunderland Process

The Maag Process

Principal of Gear Planning

6. Manufacturing of Gear Box Housing

Introduction

Market Potential

**Basis & Presumptions** 

Implementation Schedule

**Technical Aspects** 

- a. Production Details and Process of Manufacturing
- b. Quality Control & Standards

Process Flow Graphic Representation

**Pollution Control** 

**Energy Conservation** 

7. Manufacturing Process of Leaf Spring

Introduction

History of Leaf Spring

Construction of Leaf Spring

Standard Size of Automobile Suspension Spring

Material Used in Leaf Spring

Basic Characteristics of Spring Materials

Mechanical Properties of Leaf Spring

Manufacturing of Leaf Spring

Shearing

Main Eye Rolling

**Tapering** 

Drilling

Hardening

Tempering

Hardness Test

**Shot Peening** 

Market Potential

Implementation Schedule

**Technical Aspects** 

A. Production Details and Process of Manufacture

B. Quality Specification

**Process Flow Chart** 

**Pollution Control Measures** 

**Energy Conservation** 

8. Manufacturing Process of Shock Absorbers

Historical Development of Shock Absorbers

Adoption of Hydraulic Telescopic Dampers

Non-pressurised Twin Tube Telescopic Hydraulic Dampers

Gas Charged Shock Absorbers

i. Mono-tube Shock Absorbers

ii. Twin Tube Pressurised Shock Absorbers

**Spring Assisted Dampers** 

Structure of Industry, Ownership Pattern & Installed Capacity

Geographical Distribution of Shock Absorber Manufacturers

Raw Materials, Semi-finished Components Used & Their Sources of Supply

Major Imports of Raw-materials to Sustain Indigenous Production

Manufacturing Processes & Machines Generally Used

9. Manufacturing Process of Automobiles Tyres

Tyre - Modern Vehicle Design Elements

Front-wheel Drive

**Powerful Brakes** 

**Power Steering** 

'Hot Hatches'

Diesel Engines

How to Make a Tyre

Raw Material Tyre Components

Chemicals

**Textiles** 

Components

Natural Rubber

Steel

Tyre Construction

The Compound

**Primary Processing** 

Extruding

Coating

Calendering

Stages in Building a Tyre

Stage 1 - Flat Forming

Stage 2 - Shaping

Stage 3 - Moulding the Tyre

Stage 4 - Finishing and Inspection

Tyre Trouble

Problems Caused by Under Inflation

The Dangers of Overloading

The Effects of High Speed Travel

Tyre Technology

Striking the Balance

**Better Performance** 

Correct Tyre Fitment

Fitting the Right Tyre

Specifically for Taxi Tyres

**Dunlop Taxi Tyres** 

Dunlop's Classic Tyre Range

How to Fit Tyres Correctly

Specialist Wheel Types

Valves

Tubes

4 x 4 Tyres

Fitment of Radial Winter Tyres

Retread Tyres

Sidewall Markings

The Meaning of Sidewall Markings

Tyre Construction

**Major Components** 

Cross (Bias) - and Radial-ply Tyre Features

Characteristics

Ride Comfort

Acceleration and Braking

Cornering

Tyre Life

**Fuel Consumption** 

**Initial Cost** 

Tyre Material

Natural and Synthetic Rubbers

Natural Rubber (NR)

Chloroprene (Neoprene) Rubber (CR)

Styrene-butadiene Rubber (SBR)

Polysoprene Rubber (IR)

Ethylene Propylene Rubber (EPR)

Polybutadiene Rubber (BR)

Isobutene-isoprene (Butyl) Rubber (IIR)

Tyre Tread

**Tread Bite** 

**Tread Drainage Grooves** 

Tread Ribs

**Tread Blocks** 

Tread Slits or Sips

Selection of Tread Patterns

Normal Car Tyres

Wet Weather Car Tyres

Truck Tyres

Off on Road Vehicles

Tyre Profile and Aspect Ratio

Tyre Manufacturing

Tyre Sizes and Designations

**Construction Type** 

Speed Marking of Tyres

Size

Casing Profile

**Related Topics** 

Nanotechnology in Automotive Tyres

The Drivers for Better Tyres

What Nano-enabled Functionalities can Offer

**Impact** 

Economic/Industry

Impact on European Citizen

Challenges

Environment, Health & Safety

Transport: Nanotechnology in Automotive Tyres

**EU Competitive Position** 

Summary

10. Manufacturing of Auto Tubes and Flaps

Introduction

Market Potential

Basis and Presumptions

Implementation Schedule

**Technical Aspects** 

Process of Manufacture

8. HEAT TREATMENTS OF AUTOMOBILES

Introduction

Materials Used in Autovehicles

Bake Hardening Steel Sheets

High Tensile Strength Steel Sheets

Corrosion Resistant Coated Steel Sheets

**Constructional Steels** 

Case Hardening Steels

**Heat Resistant Steels** 

**Powder Metallurgy Products** 

Non-ferrous Alloy Powder Metallurgy Products

Copper Alloys

Aluminium Alloys

Magnesium Alloys

**Titanium Alloys** 

**Composite Materials** 

Plastics and Rubber

Glass and Ceramics

**Heat Treatment** 

Types of Heat Treatment

Processing Technology in Heat Treatment

Carburizing and Carbonitriding

Nitro-carburizing

Induction Hardening

Powder Metallurgy and Sintering

Key Issue in Heat Treatment: Atmosphere Control

Carbon Potential Control

Gas Carburizing Processes

Reduced Pressure Carburizing (Vacuum Carburizing)

High Pressure Gas Quenching

Carbonitriding

Low Temperature Nitrocarburizing and Oxy-nitro-carburizing

Surface Modification and Hybrid Heat Treatment

Solid Lubricant Coatings

Emerging Technologies in Materials, Heat Treatment and Surface Engineering

Materials

Carburizing and Carbonitriding

New Nitriding Methods for Aluminium

Nitriding of Stainless and Maraging Steels

Furnaces for Heat Treatment of Fasteners and Automobile Parts

Specifications of the Line

Washing Machine

Hardening Furnace

**Quenching Tank** 

Continuous Hot Blast Tempering Furnace

Double Layer Dyeing Tank

Capacity of the Main Furnace

Crucible Type Annealing Furnaces

**Application** 

Features

Specifications of the Bell Type Furnace

**Features** 

Capacity of the Quenching Tank

Capacity of the Continuous Hot Blast Tempering Furnace

Capacity of the Dyeing Tank

9. FORGING TECHNOLOGY OF AUTOMOBILE

**PARTS** 

Introduction

Features of Forgings Peculiar to Automobile

Types of Forging Processes

Open Die Forging Process

Close Die Forging Process

Steps for the Design of Forged Part

Parting Line

**Draft Angles** 

Fillet and Corner Radii

Machining Allowances

**Forging Tolerances** 

Shapes for Forging

Die Design Parafeitrs

Flash Land and Flash Gutter Design

Trimming Die Design

Hot Coining Die Design

Forging Equipments

10. PAINTING TECHNOLOGY OF AUTOMOBILES

Introduction

Spray Priming System

Dip Priming System

**Electropriming System** 

Performance

Pretreatment

Rust Removal

Alkali Degrease

Metal Phosphate (Conversion Coating)

Pretreatment as a Corrosion Inhibitor: Mechanism

**Priming** 

**Spray Priming** 

Dip Priming

**Products** 

Pigmentation

**Process** 

Electropainting

**Anodic Electrocoat** 

**Resin Systems** 

Pigmentation

**Practical Considerations** 

**Basic Plant Requirements** 

**Control Methods** 

**Deficiencies of Anodic Electrocoat Primers** 

Cathodic Electrocoat

Resin System

Pigmentation

Colour

Mechanism of Deposition

**Performance Characteristics** 

Plant Requirements

Dip Rinsing

Ultrafiltration

**Control Method** 

Pretreatment

General Appraisal and Current Developments

Surfacers

Background

Introduction

**Product Types and Formulation** 

**Resins Systems** 

Alkyds

**Epoxy Esters** 

**Polyesters** 

**Epoxies: Film Modifiers** 

Crosslinking Resins

Pigmentation

**Prime Pigments** 

Extenders

Polyurethane-modified polyester surfacer (including 'colour keyed' products)

**Summary of Basic Parameters** 

Film Properties (Stoved Film)

**Anti-chip Coatings** 

Background and Resin Types

Pigmentation

Inverted or Reverse Process

Electro Powder Coating (EPC)

**Automotive Topcoats** 

Alkyd or Polyester Finishes

**Basic Chemistry** 

**General Properties** 

Thermosetting Acrylic/NAD Finishes

**Basic Chemistry** 

**General Properties** 

Metallic Appearance

'Sagging'

'Solvent-popping' Resistance

Thermoplastic Acrylic Lacquers

**Basic Chemistry** 

**General Properties** 

Basecoat/clear Technology

Solvent-borne

Basic Chemistry

Application/Process

Colour/Pigmentation

**Aluminium Flake Orientation** 

**Undercoats** 

Performance/Durability

Water-borne

**Processing** 

Characteristics

Pigmentation of Automotive Topcoats

Solid Colours

Durability

Opacity/Gloss

Cost

Bleed

Metamerism

Use of Lead Chromate Pigments

'Single Coat' Metallics

Durability

Opacity/Gloss

Cost

Colour Matching

Choice of Aluminium Flake

Basecoat/Clear Metallics

Opacity

Cost

Colour Matching/Durability

Choice of Aluminium Flake

In-factory Repairs

Thermosetting Finishes (Panel Repairs)

Thermoplastic Acrylic Lacquers (Spot Repair)

Painting of Plastic Body Components

Sheet Moulded Compound (SMC) and Dough Moulded Compound (DMC)

Polyurethane: PU RIM and PU RRIM

Injection Moulded Plastics

**Painting Problems** 

Adhesion

**Heat Distortion** 

Surface Texture

Solvent Sensitivity

Degradation of Mechanical Properties

Paint Processes and Products

On-line

Off-line

'Part-way' Down Paint Line

**Spray Application** 

Air Spray

**Spray Losses** 

**Automatic Spray** 

Low-pressure Hot Spray

Airless Spray

Electrostatic Spray

Electrostatic Spray—Metallic Appearance

Resistivity

'Interior' Application (Electrostatic Spray)

Electrostatic Application of Water-Borne Automotive Coatings

General Plant Design Features

Paint Circulating System for Electrical Insulation

**Externally Charged Atomizers** 

Application Efficiency—Practical Considerations and Processes

Modern Spraybooth Design—Ventilation Modes

Preconditioning the Air

Concentrators

Process Details: Typical Application Parameters—Turbo Bells

Stoving Procedures

Oven Technology

**Design Considerations of Convection Ovens** 

Oven Configuration

Oven Ventilation

Oven Heating

Fresh Air Requirements

Fuel Available/Heating Method

Fume and Odour Emission

Thermal Incineration

Catalytic Combustion

**Future Stoving Developments** 

Performance/Testing

Appearance

Performance

**Physical Properties** 

Chemical Resistance

**Test Procedures** 

Cure (Test for Crosslinking Products)

Sandability (Surfacers)

Adhesion: Crosshatch Test (1.5mm or 2.0mm template)

Hardness

Stone-chip Resistance

Impact Test

Flexibility

Acid Resistance

Alkali Resistance

Acid and Alkali Resistance (Alternative Procedure)

Water Immersion (Continuous)

Humidity Resistance (Continuous)

Scab Corrosion Test

Florida Exposure (5° South)

Peel Resistance: Florida 5° South

**Accelerated Weathering** 

**Future Developments** 

High Solids Technology

Higher Solids Surfacer Technology

High Solids Polyester Topcoats

**Higher Solids Basecoats** 

Ultra High Solids Coatings

Water-Borne Products

Surfacers

**Basecoats** 

Powder Coatings and Aqueous Slurries

Aqueous Powder Slurries

Solid Colour Basecoats

Clearcoats

Pigmentation

Painting of Plastics

Electrodeposition and Spray Application

## **About NIIR**

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Our various services are: Detailed Project Report, Business Plan for Manufacturing Plant, Start-up Ideas, Business Ideas for Entrepreneurs, Start up Business Opportunities, entrepreneurship projects, Successful Business Plan, Industry Trends, Market Research, Manufacturing Process, Machinery, Raw Materials, project report, Cost and Revenue, Pre-feasibility study for Profitable Manufacturing Business, Project Identification, Project Feasibility and Market Study, Identification of Profitable Industrial Project Opportunities, Business Opportunities, Investment Opportunities for Most Profitable Business in India, Manufacturing Business Ideas, Preparation of Project Profile, Pre-Investment and Pre-Feasibility Study, Market Research Study, Preparation of Techno-Economic Feasibility Report, Identification and Section of Plant, Process, Equipment, General Guidance, Startup Help, Technical and Commercial Counseling for setting up new industrial project and Most Profitable Small Scale Business.

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Our Detailed Project report aims at providing all the critical data required by any entrepreneur vying to venture into Project. While expanding a current business or while venturing into new business, entrepreneurs are often faced with the dilemma of zeroing in on a suitable product/line.

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