Design for Cost Effective Weight Reduction

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How can we achieve light-weighting through vehicle design?

Vehicle Design

Business Strategy for Cost Effective Light-weighting

Use of Virtual Environment Tools

Optimisation of Material Application

Additional Challenges for Battery Electric Vehicles
Vehicle Design
Vehicle Design Challenges

Increased Performance

Reduced Cost

Enhanced Safety

Improved Environmental Compatibility

All promote weight reduction
Holistic Approach to Mass Reduction

- Performance
- Cost Savings
- Vehicle Dynamics
- Trailer Towing
- Fuel Economy
- Braking
- Emissions
- Payload

MASS REDUCTION IS SELF PERPETUATING – LIGHTER VEHICLES NEED LIGHTER COMPONENTS
Product Life Cycle (PLC) – 4 Stage Model

Stage 1: Research and development
Stage 2: Growth
Stage 3: Maturity
Stage 4: Decline

Source: business-fundas.com
Design Impact on Product – PLC Influence

Profitable Business:
Maximise Return on Investment

Source - Wikipedia
Vehicle Design Challenges

- Increased Performance
- Reduced Cost
- Enhanced Safety
- Improved Environmental Compatibility

All promote weight reduction
The Complexity of Automotive & Material Legislation - the Nissan Perspective

- **Sector Specific Activities**
  - ELV Directive
  - Tyre Directive
  - Batteries & Accumulator Directive
  - Environmental Indicators
  - Type Approval Directive
  - Waste Oil Directive
  - Electronic steering and braking

- **Issue Specific Activities**
  - WEEE & ROHS Directive
  - Waste Framework Directive
  - Hazardous Waste Directive
  - Integrated Pollution Prevention and Control
  - Sustainable Use of resources
  - Integrated Product
  - New Chemical Policy
  - Disposal/Recovery Classification
  - Incineration
  - Landfill
  - Shipment of Waste
  - Sewage sludge

- **Generic Activities**
  - Waste Definition
  - Waste Prevention & Recycling
  - Energy Using Products
  - Sustainable Use of resources
  - Integrated Pollution Prevention and Control
  - Waste Framework Directive
  - Hazardous Waste Directive

- **Recycled material in new vehicles**

- **Homologation**
Business Strategy for Cost Effective Light-weighting
Business Strategy

Maintain & Enhance Brand Values
‘Innovation and Excitement for Everyone’

Design Lead Automotive Organisation
‘Bold, Smart, Accessible’
‘Challenge Convention’

Utilisation & Development of Alliance / Partnerships

Global Presence

Mass Production – 50-250,000 units / annum

Lead Design & Production Strategy
**Business Strategy**

Clear and consistent strategy that is understood and supported with 100% commitment by all employees

**Nissan Revival Plan NRP**
Focus on reviving our company – returning to profitability, reduced debt

**Nissan 180**
Focus on structuring for profitable growth – +1m units, 8% profit, 0 debt

**Nissan Value-Up**
Focus on enhanced value with sustained performance

**Nissan Power 88**
Focus on growing our company – 8% market share, 8% profit maintain

In the last 10 years Nissan has moved from Revival to Stability to Growth based on the above strategies
Global market share by FY16 (%): 8

Sustainable COP (%): 8

Brand & sales power: POWER
With the CUSTOMER central in everything we do, our next plan is based on
4 Foundations + 3 Corporate Goals + 6 Strategic Pillars

Power

Brand & Sales Power

Global Market Share %

Minimum COP%

≥8

at the earliest timing

NISSAN POWER 88

PRODUCTS

PROCESSES

PEOPLE

ALLIANCE
Design Based Weight Reduction Strategy

Holistic Design – Define Clear Vehicle Level Targets

Cascade Weight, Cost & Performance Targets to System Level

Mid / long term strategy – Resource / Conversion Energy

Weight reduction / Cost / Perceived Quality Improvement

Work as a Monozukuri (Cross Functional Team) to ‘Engineer the Vehicle’

Utilise Computer Aided Engineering to Increase Efficiency & Reduce ‘Time to Market’
Use of Virtual Environment Tools
Virtual Environment Tools

CAE Application for Design Optimisation

Simultaneous / Cross-functional Design, Analysis & Test

‘Live’ Manufacture / Assembly Collaboration

Life Cycle Analysis with Operation, Maintenance, Repair & ELV Input

Reduce Requirement for Physical Prototype / Test

Cost / Time / Resource Savings

Ability to Simulate and Predict Performance of Material Selection & Rapidly Compare Competing Technologies
Optimisation of Material Application
Vehicle Mass Evolution

Vehicle mass has increased by 8 kg/year
Additional Challenges for Battery Electric Vehicles
Electric Vehicles - Future Challenges

Weight Reduction Essential to Off-set Current Battery Weight

New / Different Customer Expectations

Increased Urbanisation – Reduced Journey Distances / Increased Congestion

Potential for Greater Feature Integration

Opportunities for New Vehicle Architectures

Ability to Challenge Existing Design Concepts

CO2 Emission Elimination at Point of Use – Requires Improved Electricity Generation – Collaboration with Suppliers / Distributors
Developing Global Partnerships

- Fleets
- Governments
- Standards
- Utilities
- Network
- Technologies
- IT
Nissan EV Concepts and Future Models

ESFLOW

Nuvu

Mixim 1
Renault EV Concepts, Current / Future Models

Zoe - Sports

ZE - Urban

Twizzy – City Car