They Say Everything is Bigger in Texas…
Except Toyota’s Environmental Footprint

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Toyota Manufacturing & R&D in N.A.

Vehicle Assembly (8)  Corporate Headquarters

Unit Plant (8)  Prod Engineering

R&D (4)  Manufacturing

Purchasing

29 Million Sq.Ft.
Manufacturing Production in N.A.

- Camry
- Camry Hybrid
- Avalon
- Avalon Hybrid
- Corolla
- Lexus RX 350/450h
- Sienna
- Tacoma
- Highlander
- Highlander Hybrid
- Sequoia
- RAV4
- RAV4 Hybrid
- Tundra
- Lexus ES 350
- Avalon
- Avalon Hybrid
- Corolla
- Lexus RX 350/450h
- Sienna
- Tacoma
- Highlander
- Highlander Hybrid
- Sequoia
- RAV4
- RAV4 Hybrid
- Tundra
- Lexus ES 350
TMNA Impact (as of 2016)

**Total Investment:**
- $29.1 Billion

**Employment:**
- 46,400

**Vehicle Production:**
- 2.12 Million

**Local Purchasing:**
- $35.3 Billion
World Around Us is Changing, Global Development Increasing CO2
TOYOTA’S PLAN

Aiming to Establish a Future Society in Harmony with Nature

Toyota Environmental Challenge 2050
Challenge to Zero & Beyond
So... What is Challenge 2050

**CHALLENGE 1**
Eliminate almost all CO₂ emissions from Toyota vehicles

**CHALLENGE 2**
Eliminate all CO₂ emissions from the manufacturing of parts and materials used to produce Toyota vehicles

**CHALLENGE 3**
Eliminate all CO₂ emissions from Toyota facilities, logistics and processes

**CHALLENGE 4**
Ensure all Toyota facilities and processes conserve and protect water resources

**CHALLENGE 5**
Ensure all Toyota facilities and processes support a recycling-based society

**CHALLENGE 6**
Ensure all Toyota facilities and processes operate in harmony with nature
Next generation vehicles to accelerate technological development to follow market expansion of HV
Next generation vehicles approaches zero CO2 during driving however, steps back in material, parts/vehicle production
Eliminate all CO₂ emissions from Toyota facilities, logistics and processes.
Challenge 4: Toyota facilities & processes conserve & protect water resources

Thoroughly reduce the amount of water used
Minimize the water consumption at all plants and use more rainwater to minimize the impact on community water resources

Clean thoroughly and return
Returning higher water quality than the drainage area to the community has a positive impact on the environment.

"Thoroughly reduce the amount used"
"Thoroughly clean drainage"
Vehicle Design and Manufacturing:
(1) Utilize eco-friendly materials
(2) Use parts longer
(3) Develop recycling technology
(4) Reuse materials from end-of-life vehicles
Challenge 6: Toyota facilities & processes operate in harmony with nature

2. Activity outline (Overall image) of "Plant in Harmony with Nature"

Contribute to conservation of local biodiversity by connecting to "Living creatures", "Habitat", "People" and "Region"

- **Action I**: Decision of indicator species
- **Action II**: Creation, maintenance & improvement of habitats
- **Action III**: Ecosystem evaluation by checking indicator species

**Yokoten to off-site, neighbor plants**
- Including other companies

**Publicity in collaboration with NGO etc.**

Promote human resource development and communication

- **"People"**
  - Employees themselves act

- **"Region"**
  - Together with local residents
  - Cooperation with local experts

Ecological pyramid

"Living creatures"

"Habitat"
Inside Challenge 1: Vehicle CO\textsubscript{2} Emissions

Toyota’s innovative FC unit

Efficiency and reliability
Challenge 1: Vehicle CO₂ Emissions

- 2.35 megawatts of electricity
- 1.2 tons of hydrogen per day
- Enough to power roughly 2,350 homes
- Meet the daily driving needs of nearly 1,500 vehicles
Challenge 1: Vehicle CO₂ Emissions
Challenge 1: Vehicle CO$_2$ Emissions

Toyota Fuel Cell Heavy Truck
Side-by-Side Acceleration Demonstration
Inside 2050 Challenge 3

1. New Vehicle Zero CO₂ Emissions Challenge
2. Challenge of Establishing a Recycling-based Society and Systems
3. Plant Zero CO₂ Emissions Challenge
4. Challenge of Minimizing and Optimizing Water Usage
5. Challenge of Achieving Zero
6. Challenge of Establishing a Future Society in Harmony with Nature
Energy Management is not new to Toyota

Since 2003, Reduced energy needed per vehicle by 38% across our 14 North American manufacturing facilities.

Since 2003, Saved 6MMetric tons of CO2.

CARBON
CARBON is one of Toyota's four focus areas in North America. We are working to reduce the carbon footprint of our products and our operations, and conducting outreach activities that help our stakeholders do the same. Climate change is a significant challenge facing the global community. We are working at every stage of the vehicle life cycle to help the world build a low carbon future.

Highlights:
1. Toyota Mirai is the first hydrogen fuel cell 300 mile range vehicle that fuel and emits only water.
2. We received our 11th Excellence Award for greenhouse gas performance. All plants have reduced carbon emissions by 50.5%.
Stationary CO$_2$ Reduction Strategy

CO$_2$ Reduction

- 50% Kaizen
- 25% PE Technology
- 25% Renewables

Target Line

Base year

FY14  FY18  FY26  FY31  FY51

448 - New Target (▲61%)
KAIZEN: CO2 Reduction Projects

Kaizens that our Team Members have implemented

- **201 kMT**

- **50%**

- **25%**

- **25%**

**HVAC Filters**

Subject: HVAC Energy and Maintenance Costs

<table>
<thead>
<tr>
<th>Operation</th>
<th>Original Condition</th>
<th>Current Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front loading filters</td>
<td>Frequent changes, high fan speed</td>
<td></td>
</tr>
<tr>
<td>Full filters</td>
<td>Longer service, lower fan speed</td>
<td></td>
</tr>
</tbody>
</table>

One plant results:

- **Annual cost**: $1,123,000
- **Savings**: $1,123,000
- **Savings (%)**: 50%

**Non-Production Usage**

- Reduce energy consumption during non-production time
- Shutting off equipment during non-production time → Energy Savings

**VFD on Pump Motors**

Subject: Nine Process Pumps Without VFDs

<table>
<thead>
<tr>
<th>Operation</th>
<th>Original Condition</th>
<th>Current Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>No control of pump output</td>
<td>Energy Use</td>
<td>Reduced pump discharge</td>
</tr>
</tbody>
</table>

- **Pump speed at 60Hz**, valve adjusted to restrict flow
- Control flow with VFD to reduce pump’s energy consumption

**Cost Savings**

- **$ 235,242**
- **CO2 Reduction**: 2304.1
Technology

Design in CO2 Savings

Issue: CO2 increases or decreases due to Prod & Process

A. Recent Examples:

- **TNGA (Casting)**: 
  - CO2 +2%
  - Development (2020)
  - Volume ▲50%
  - CO2 reduction ▲30%
  - 46 M/C’s

- **Laser Screw Weld (LSW)**: 
  - CO2 +3%
  - No Compressed air
  - Side air
  - Need Compressed Air
  - Current (Spot Welding)
  - 23 M/C’s
Renewables – 2 Stage Approach

Toyota RE Strategy

On-site Systems
- TMNA HQ – Plano, TX
- TMMBC
- TMTTX

Utility Co Power Purchase Agreements
- TVA
- AEP
- KU
- VECTREN

Virtual Power Purchase Agreements

101 kMT

CO2

50% 25% 25%

15% On-Site

85% Off-Site

85% Off-Site

15% On-Site
Toyota’s Impact in Texas

8.7 MW Sun Power System
More than 20,000 panels
33% Office Load

3.1 MW Sun Power System
More than 8,700 panels
1st Roof Top System on MFG Fac
Summary

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**CO₂ Reduction Targets**

- **Actual CO₂**: 1,149 kMT
- **FY17-21**: 402 kMT
- **FY31 2030**
  - **CO₂**: 747 kMT (35%)
  - **Renewables**: 25%
  - **PE Technology**: 25%

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**Challenge of Achieving Zero**

1. **Challenge 1**: How to achieve zero CO₂ emissions
2. **Challenge 2**: How to minimize and optimize water use
3. **Challenge 3**: Plant zero CO₂ emissions
4. **Challenge 4**: How vehicle zero CO₂ emissions
5. **Challenge 5**: Challenge of establishing a recycling-based society and systems
6. **Challenge 6**: Challenge of establishing a future society in harmony with nature
Toyota embraces being a sustainable leader

Developed 6 challenges that touch our business from design to manufacture to end-of-life products

Seeks opportunities to reduce environmental impact through Kaizen

Thank you