Toyota Environmental Challenge 2050

Ever-better manufacturing

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• Outline of Toyota

• TOYOTA Environmental Challenge 2050

• Renewable Energy

• Summary
Toyota conducts its business worldwide with 54 manufacturing companies in 28 countries, 364,445 employees.
Toyota vehicles are and sold to more than 170 countries. The business has been managed via 9 regions. TDEM is responsible for Asia region\(^1\)

\(^1\)Asia includes South East Asia and South Asia (except China, Taiwan, Japan, Korea)
Toyota manufacturing business in Asia covers 11 companies in 8 countries

Assembly: 8 companies
Unit: 3 companies

Pakistan
India
Thailand
Vietnam
Malaysia
Indonesia
Taiwan
Philippines
TOYOTA ENVIRONMENTAL CHALLENGE 2050

1. New Vehicle Zero CO₂ Emissions Challenge
2. Life Cycle Zero CO₂ Emissions Challenge
3. Plant Zero CO₂ Emissions Challenge

Challenge of Minimizing and Optimizing Water Usage
Challenge of Establishing a Recycling-based Society and Systems
Challenge of Establishing a Future Society in Harmony with Nature

PLUS
Net Positive Impact Challenge
2030 milestone toward Toyota Environmental challenge 2050

**Challenge 3: Plant Zero CO₂ Emissions Challenge**

Achieve zero CO₂ emissions at all plants worldwide by 2050

**2030 Milestone**

- Reduce CO₂ emissions from global plants by 35% compared to 2013 levels

Press release: Sept./2018
Challenge 3 - Plant Zero CO₂ Emissions

- CO₂ emissions under BAU

Reduce by using:

1. Low CO₂-emitting production technologies
2. Daily Kaizen activities
3. Using renewable energy and hydrogen

Plant CO₂ emissions ⇒ Aiming for zero in the long run
Low CO2 Production Technologies
• Thoroughly shortening production process
• Minimization and energy saving of moving parts
• Recovery of wastes energy
• Increasing energy storage

Casting Process

<table>
<thead>
<tr>
<th>Downsize equipment</th>
<th>Harden sand mold at low temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing (2001)</td>
<td>Existing</td>
</tr>
<tr>
<td>Development (2020)</td>
<td>Development</td>
</tr>
</tbody>
</table>

- Volume ▲50%
- CO2 reduction ▲30%
- Organic sand mold harden at high temperature
- Inorganic sand mold harden at low temperature

Energy saving ⇒ CO2 reduction by 40%
Daily Kaizens

• Elimination of unnecessary/inconsistent/unreasonable efforts
• Unpowered/low-thrust operation energy

Karakuri Mechanism
Using gravity or magnetic force to move tools without any external energy

Daily Kaizen Management
One of the core principles of Toyota Production System
“Continuous improvement “
‘Always a Better Way’
3 Renewable Energy

- Elimination of unnecessary/inconsistent/unreasonable efforts
- Unpowered/low-thrust operation energy

Toyota Group In-house, and on the premises
- Production plants & office buildings
- Improve amount per unit
  - Accelerate low CO2 innovative technology
  - Daily Kaizen
  - Energy conversion (Steam, airless)

Local (Business and residential) Motomachi Proof Test

Power transmission infrastructure
- Power transmission

Purchase from renewable energy operators
- Wind power
- Solar power
- Biomass
- Geothermal, hydro power, etc.

As the first process, wind power generation will be introduced in domestic plants by around 2020, for zero CO2 in the FCV production line

Toyota de Brazil in Brazil will be the first plant to start the use of 100% renewable energy from 2015
This project aims the reduction of CO2 emission by installing 1.1MW solar panel on the rooftop of the vehicle assembly factory of Toyota Motor Philippines Corp. in the south of Manila. Electricity generated by solar power system is consumed in house and replaces part of grid electricity consumption.

859 tonCO₂/year
= (Reference CO₂ Emission) - (Project CO₂ Emission)
= ((Reference Power consumption) - 0) × CO₂ Emission Factor
Unit: CO₂ Emission [tCO₂/year]
Power Consumption [MWh/year]
CO₂ Emission Factor [tCO₂/MWh]
Renewable Energy introduction on SITE

Project Title: Introduction of 3.4 MW Rooftop Solar Power System in Technical Center and Office Buildings

PP (Japan): Toyota Motor Corporation, PP (Thailand): Toyota Daihatsu Engineering & Manufacturing Co., Ltd.

Outline of GHG Mitigation Activity

This project aims the reduction of CO2 emission by installing 3.4 MW solar power system on the rooftop of the technical center and office building of Toyota Daihatsu Engineering & Manufacturing Co., Ltd. located in Samutprakarn in eastern Bangkok.

Electricity generated by solar power system is consumed in-house and replaces part of grid electricity consumption.

Expected GHG Emission Reductions

1,617 tCO2/year

Project emission is assumed to be zero.

Reference emission:
Annual electricity generation x CO2 emission factor
= 5,069 MWh/year × 0.319 tCO2/MWh
= 1,617 tCO2/year

GHG emission reductions:
Reference emission - Project emission
= 1,617 - 0 = 1,617 tCO2/year
# RE Implementation Target in ASEAN

<table>
<thead>
<tr>
<th>Country</th>
<th>Target of RE implementation</th>
<th>Target of Solar PV installation</th>
</tr>
</thead>
</table>
| ASEAN     | 23% of RE in energy mix within 2025  
*From 2016-2025 Action Plan of ASEAN Energy Cooperation (APAEC) | - |
| Thailand  | 30% of alternative energy in energy consumption within 2036  
*From Alternative energy development plan (Sep 2015) | 6,000 MW within 2036  
*From Alternative energy development plan (Sep 2015) |
| Vietnam   | 27 GW within 2030 (129.5 GW)  
*From Power Development Plan 7th revision (Mar 2016) | • 4 GW within 2025  
• 12 GW within 2030  
*From Power Development Plan 7th revision (Mar 2016) |
| Malaysia  | • 2,080 MW within 2020  
• 4,000 MW within 2030  
*From 2010 National RE Action Plan | • 175 MW within 2020  
• 4,000 MW within 2030  
*From 2010 National RE Action Plan |
| Indonesia | 23% of total energy consumption within 2025 | NONE |
| Philippines | 15 GW of power capacity within 2030 | • 500 MW within 2016  
• 1,528 MW within 2030 |