

# **CHANGAN FORD MAZDA AUTOMOBILE CO., LTD – CHONGQING, CHINA**



**CFMA - CQ GHG Inventory**

**Draft 2007 Report**

**April, 2008**

## **Executive Summary:**

Changan Ford Mazda Automobile Co., Ltd (CFMA CQ) is proud to be the first automobile company in China to voluntarily report its Facility Greenhouse Gas (GHG) emissions using a standard GHG Accounting and Reporting protocol. CFMA CQ is aware of the importance of Climate Change and it is committed to constantly improve its environmental standards. By reporting our GHG emissions locally we hope to support the government's efforts to address Climate Change. We believe that climate change is a serious environmental issue and, recognize that it is not possible to wait for all the uncertainties to be resolved before acting.

Ford is proud to participate in different greenhouse gas management initiatives around the globe including: The Chicago Climate Exchange (CCX), The Mexican GHG Program, The Philippine Greenhouse Gas Accounting and Reporting Program (PhilGARP), The Australian GHG Challenge Plus Program, The EU Emissions Trading Scheme (EU ETS), and The Canadian GHG Challenge Registry.

This 2008 report includes CFMA CQ data from 2003-2007. Emissions intensity (performance emissions - tCO<sub>2</sub>/vehicle built) decreased by 44% from its baseline and is an improvement over 2006 (22% reduction) which means the site is operating more efficiently, emitting lower emissions per vehicle produced. Overall, CFMA CQ has increased its absolute emissions by 55% from its baseline (2003-2006) as a direct consequence of the production increase at the site however, the emission increase is considerably lower than the production increase (70% compared to the baseline average). CFMA CQ will provide annual updates as it continues to strive to maintain and exceed its environmental standards.

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## **1. Introduction:**

Changan Ford Mazda Site at Chongqing includes the following entities:

- CFMA – CQ Assembly Plant
- CFMA – CQ Stamping Plant
- CFMA – CQ Product Development
- CFMA - CQ Administration Facilities
- CFMA – CQ Engine Plant

The GHG inventory contained in this report includes data from all CFMA CQ entities listed above. It should be noted that vehicle fleet and other mobile sources are not included in this inventory however office buildings are included in the inventory.

Changan Ford Mazda Assembly Chongqing (CFMA - CQ) is a joint venture between Ford Motor Company, Mazda Motor Corporation, and Changan Motors and was established in April of 2003. The car Assembly Plant is located in the Northern Development Region, Chongqing, and currently has a capacity of 250,000 units per year. The plant first began production of the Ford Fiesta on January 18 of 2004, followed by Ford Mondeo (Mar. 20, 2004); 4-door Ford Focus (Sep. 21, 2005); Mazda3 (Feb. 27, 2006); Volvo S40 (July 17, 2006); 5-door Ford Focus (Aug. 23, 2006); and Ford S-MAX (Mar. 15, 2007). The introduction of Volvo products and increased Ford Focus manufacture has now brought production volumes up to 250,000 units per year with plans to achieve 290,000 by the end of 2008.

Changan Ford Mazda Chongqing has a sister plant in Nanjing, Jiangsu and also an engine plant (CFME) in Nanjing. These facilities are not included in this report but may be included in future GHG inventories.

One of the most important initiatives undertaken by CFMA CQ is the implementation of the ISO 14001 environmental management standard, where all aspects of the facility are included: air emissions, waste, water, and energy. In order to remain certified, a facility must undergo a surveillance audit each year that ensures adherence to guidelines, and measures the plant's progress. A highlight of CFMA CQ's performance is the use of detailed management systems for all resource use. (energy, solid & liquid waste, solvent use and water). Other environmental initiatives include: energy efficiency projects at the sites and educational programs for employees. Ford Motor Company and Changan Ford Mazda recognize the

importance of the climate change issue and will continue to work on reducing the greenhouse gas emissions of its vehicles and facilities by way of introducing advanced technology vehicles and improving energy-efficiency of manufacturing operations.

### **1.1 CFMA CQ in China**

**Product:** Ford Focus, Ford Fiesta, Ford Mondeo, Mazda3, Mazda 7, Volvo S40, Volvo S80

**Founded:** April, 2003

**Plant Capacity:** 250,000 units/year

**Operation:** Assembly, Stamping, Engine & Research Centre

**Employees (2008):** 5500 employees

**Site:** 460,000m<sup>2</sup>

**Floor Space:** 322,000m<sup>2</sup>

**ISO 14001Certified:** 2003



**Figure 1: Mazda 7**



**Figure 2: Ford Focus**



**Figure 3: Volvo S40**



**Figure 4: Ford Mondeo**



**Figure 5: Mazda 3**

## **1.2 Corporate Practices on Climate Change:**

Changan Ford Mazda Automobile Company is proud to be the first automobile company to voluntarily report its GHG emissions in China. We believe that climate change is a serious environmental issue and recognizes that it is not possible to wait for all the scientific uncertainties to be resolved. Ford Motor Company is actively participated in various programs around the world gaining a vast experience in GHG reporting. Some of the initiatives are listed below:

### **CFMA Chongqing – China:**

CFMA CQ is pleased to be the first automotive company in China to report its GHG emissions. We wish to share our GHG experiences with other companies and sectors around the world.

### **Chicago Climate Exchange (CCX):**

The Chicago Climate Exchange (CCX) is a greenhouse gas (GHG) emission reduction and trading program for emission sources and projects in North America. It is a self-regulated, rules based exchange designed and governed by CCX members. These members have made a voluntary, legally binding commitment to reduce their emissions of greenhouse gases by six percent below 2000 baseline year by 2010. Ford is the first and only auto manufacturing participant in this program.

### **Mexico GHG Pilot Program:**

The Mexico GHG Program started as two year partnership between La Secretaria de Medio Ambiente y Recursos Naturales (SEMARNAT), World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD). It is a voluntary program established to help Mexican companies to quantify greenhouse gas emissions. Ford Motor Company was proud to be the only auto manufacturer to participate in the first phase of the program where we are committed to reporting emissions annually.

**EU Emissions Trading Scheme (EU ETS):**

Ford participates in the EU ETS which commenced in January 2005 and is one of the policies being introduced across Europe to reduce emissions of carbon dioxide and other greenhouse gases. The second phase of this program runs from 2008-2012 and coincides with the first Kyoto Commitment Period. Further 5-year periods are expected subsequently.

**Canadian Voluntary Challenge and Registry:**

Ford voluntarily reports GHG emissions to the Canadian Voluntary Challenge and Registry (VCR). It has been reporting annual emissions since 1999. Over the years, it has received the highest level of achievement in the reporting system, which includes two Leadership Awards in the Automotive Manufacturing Sector category as well as qualifying as a Silver Champion level Reporter in 1999 and Gold Champion Level Reporter from 2000 to 2003, 2005 & 2006.

**Philippines GHG Program**

The Philippine Greenhouse Gas Accounting and Reporting Program (PhilGARP) - partnership between Klima Climate Change Center of the Manila Observatory, Philippine Business for the Environment, the Department of the Environment and Natural Resources, Department of Energy, WBCSD, and WRI – was launched in November 2006. To date, 15 companies are completing GHG inventories. Ford was the first and only automobile company to submit a report to the program.

**2. Methodology:**

The data used to calculate the baseline and reporting year is based on actual electricity and natural gas invoices obtained directly from the utilities and gasoline invoices from the supplier. CFMA CQ uses a best in class energy monitoring system and an industry-leading Global Emissions Manager (GEM) database to ensure environmental metrics such as CO2 emissions are tracked consistently. All energy data contained in this report is available within GEM and it is tracked and revised by facility.

The emissions data reported was generated following the greenhouse gas calculation tools contained in the Corporate GHG Accounting and Reporting Guide, which was developed by the World Resources Institute (WRI) and the World of Business Council for Sustainable



Development (WBCSD). Specifically, the calculation tools referenced include Indirect CO2 emissions from the consumption of purchased electricity, heat, and/or steam and revised tool for direct emissions from stationary combustion, obtained from the website [www.ghgprotocol.org](http://www.ghgprotocol.org). The report includes "direct" emissions characterized as scope 1 in the WRI/WBCSD protocol and "indirect" or scope 2 emissions from the same protocol. All CO<sub>2</sub> emissions are included and reported in units of metric tons of carbon dioxide (CO<sub>2</sub>). Other Greenhouse gases applicable to combustion processes, CH<sub>4</sub> and N<sub>2</sub>O, are estimated to be less than 1% of the total emissions and hence considered negligible. Other emission sources such as HFCs from refrigerant leakages during the initial vehicle fill process for the air conditioning units are also considered minimal at less than 1.5 % of total emissions. PFCs and SF<sub>6</sub> do not apply to the company's manufacturing facilities.

For emissions calculations, the factor of 0.000849 tCO<sub>2</sub>/KWh was used to convert electricity usage to indirect CO<sub>2</sub> emissions based on the latest available emission factor for the consumption of electricity in China as referenced in the WRI/WBCSD calculation tools. Emission factor of 0.00186732 tCO<sub>2</sub>/m<sup>3</sup> and 0.0023403 tCO<sub>2</sub>/l were utilized to convert natural gas usage and gasoline usage to CO<sub>2</sub> emissions. Refer to Table 1 for further details.

**Table 1: Emission Factors**

<b>Type of Emissions</b>	<b>Factor</b>
Natural Gas	0.00186732 tCO <sub>2</sub> /m <sup>3</sup>
Gasoline/Petroleum	0.0023403 tCO <sub>2</sub> /l
Electricity (WRI/WBCSD)	0.000849 tCO <sub>2</sub> /KWh

\*From WRI/WBCSD

### 3. Base Years:

CFMA CQ began operations in 2003 and has increased production every year. To better represent our GHG emissions the baseline is calculated based on the average of the first four years of operation (2003-2006). Tables 2 and 3 show the direct and indirect emissions used to obtain the baseline.

Note: Direct emissions are those generated on site (i.e. from gas or petroleum fuel use). Indirect emissions are from those generated off site but attributable to car manufacturing (i.e. electricity us.

**Table 2: Direct Emissions**

CFMA				
Direct Emissions (metric tCO2)				
2003	2004	2005	2006	Baseline
4,578	9,910	17,157	25,461	14,276

**Table 3: Indirect Emissions**

CFMA				
Indirect Emissions (metric tCO2)				
2003	2004	2005	2006	Baseline
14,572	22,852	43,407	64,154	36,246

### 4. Emission Data:

Changan Ford Mazda Chongqing manufacturing, engine and stamping plants were constructed with state of the art technology that allows the plants to operate in an energy efficiency matter. CFMA CQ's internal energy management and control process allows the plants to monitor energy usage throughout the facilities and identify areas that can be improved. Ford Motor Company has also implemented a global environmental database, Global Emissions Manager (GEM), which serves as a repository for all energy data and ensures reporting consistency at all facilities around the globe.

CFMA CQ is committed to improving energy efficiency and reducing its GHG emissions.

The plants have implemented several projects to reduce its energy consumption (electricity and natural gas) including:

- Installation of new power conditioning equipment (Active Dynamic Overtone - Accusine -300A and PQF – 225A) which improves digital encoding and decoding allowing lower distortion and higher resolution in our welding and painting process. The new transformer stations use higher reflection speed reducing overtone (natural resonance or vibration frequency of a system) translating to a 0.8% electricity reduction per year (288,000KWh) at our welding process and 0.8% reduction per year (345,000KWh) at our Painting process.
- Installation of a Humidification control at the paint shop. This technology allows the humidity (an important factor for paint quality) to remain constant throughout the year while varying the temperature (lower during winter time and higher during summer time). This reduces the amount of energy required for heating during the winter time and air conditioning during the summer.
- Installation of heating and air conditioning controls that allow constant temperatures throughout the facility.
- Installation of automatic roll-up doors at each production station to reduce the amount of heat/air conditioning losses to the outside.
- Automated lighting control throughout the facility (street lighting, parking lots, workshops, etc.) helps ensure lights are off when unnecessary.

Below is a summary of CFMA CQ's energy consumption from 2003-2008.

**Table 4: Energy Consumption**

<b>CFMA CQ - Energy Consumption</b>			
<b>Period</b>	<b>Natural Gas (m3)</b>	<b>Gasoline (l)</b>	<b>Electricity (KWH)</b>
<b>2003</b>	<b>2,143,408</b>	<b>153,624</b>	<b>17,164,020</b>
<b>2004</b>	<b>4,353,949</b>	<b>573,033</b>	<b>26,915,840</b>
<b>2005</b>	<b>8,000,597</b>	<b>603,244</b>	<b>51,126,800</b>
<b>2006</b>	<b>11,326,710</b>	<b>1,354,553</b>	<b>75,564,337</b>
<b>2007</b>	<b>13,137,293</b>	<b>1,805,376</b>	<b>97,571,938</b>

#### **4.1 Direct Emissions:**

Direct Emissions result from combusting fuels at the CFMA site including natural gas and gasoline. Table 5 shows direct emissions from 2003-2007.

**Table 5: CFMA CQ Emissions from 2003-2007**

<b>CFMA - CQ</b>	
Direct Emissions/Year (tCO <sub>2</sub> )	
<b>2003</b>	4,578
<b>2004</b>	9,910
<b>2005</b>	17,157
<b>2006</b>	25,461
<b>2007</b>	30,079

#### **4.2 Indirect Emissions**

CFMA CQ's Indirect Emissions include all emissions generated outside the site's perimeter such as emissions from burning fossil fuel to generate electricity. CFMA CQ continuously monitors its electricity consumption, however the rate of energy consumption depends heavily on production, and if production increases, so will energy consumption. Table 6 shows indirect emissions per year from 2003-2007.

**Table 6: Indirect CFMA CQ Emissions from 2003-2007**

<b>CFMA CQ</b>	
Indirect Emissions/Year	
<b>2003</b>	14,572
<b>2004</b>	22,852
<b>2005</b>	43,407
<b>2006</b>	64,154
<b>2007</b>	82,839

## **5.0 Data Analysis:**

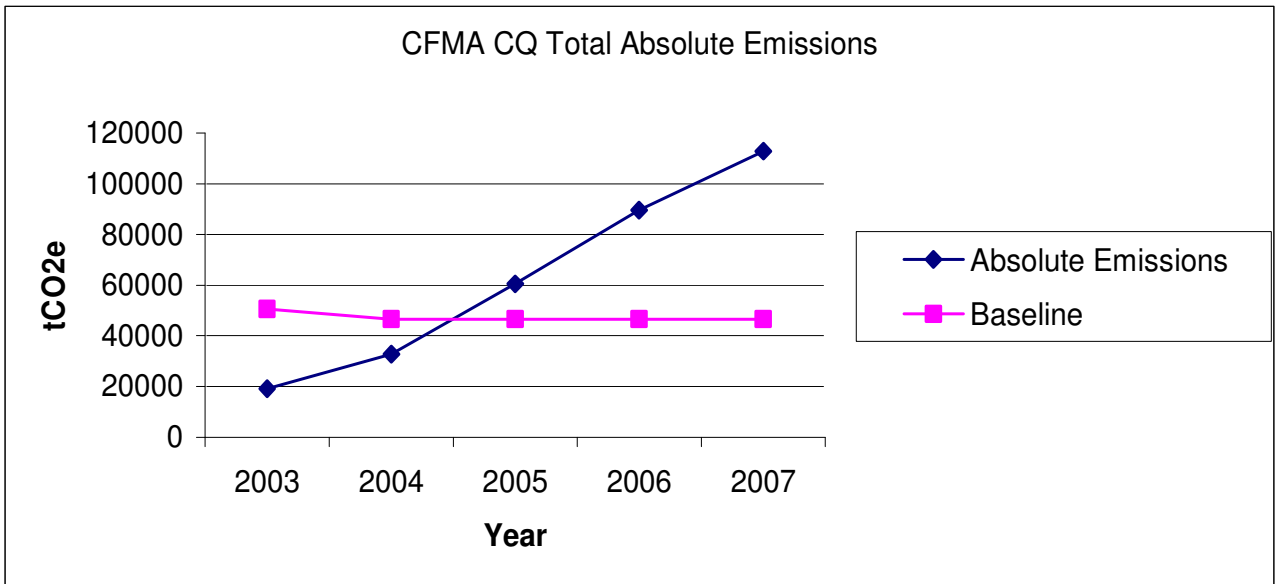
CFMA CQ's production has increased significantly over its five years of operation. The introduction of Volvo S40 and increased Focus manufacture has increased production to 250,000 units/year with plans to increase even more by the end of 2008. Table 7 shows CFMA CQ production data from 2003-2007.

**Table 7: CFMA CQ Production Data (2003-2007)**

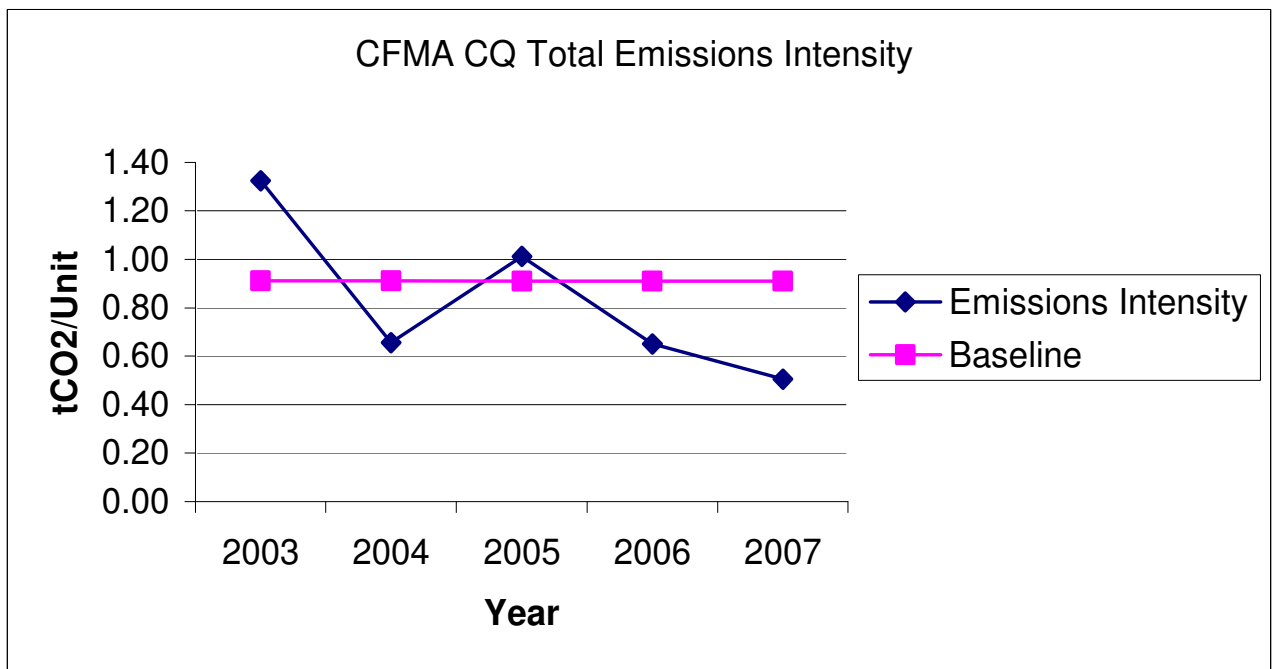
<b>CFMA CQ</b>	
Production Units	
2003	14,465
2004	50,020
2005	59,827
2006	137,782
2007	223,602

In 2007, CFMA CQ in China increased its production 70% compared with the baseline years (2003-2005) and 38.4% compared to 2006. Absolute emissions are directly proportional to production, if production increases so does absolute emissions. CFMA CQ implemented many projects and activities to reduce energy consumption and becoming more efficient, as a result CFMA CQ's GHG emissions have being small compared to the increased of production (increase of 55% compared to the baseline years (2003-2006) and 21% compared to 2006) (Figure 7).

**Figure 6: CFMA CQ Absolute Emissions (2003-2007)**



**Figure 7: CFMA CQ Emissions Intensity (2003-2007)**



Emissions intensity can be used to measure efficiency on an energy use per car basis. Emission intensity is calculated by dividing absolute emissions by the number of production

units (vehicles built). In 2007, emissions intensity decreased almost 49% in comparison to the baseline years (2003-2006) and 23% compared to 2006 (Figure 8) which means that the plants are emitting lower emissions per vehicle produced. This emissions intensity reduction is the result of running CFMA CQ operations closer to design capacity. The figure above shows an increase in 2005 intensity emissions that is due to inefficiencies associated with the implementation of new paintshops and associated facilities, in that year.

## **6. Conclusion:**

CFMA CQ is proud to be the first automobile company in China to voluntarily report its GHG emissions. This first report includes data from 2003-2007. CFMA CQ recognizes the importance of the climate change issue and supports emissions reporting at a national level. CFMA CQ is committed to improving energy efficiency, reducing GHG emissions and maintaining and exceeding its environmental standards.

CFMA CQ has experienced an increase in production in its first five years of operation. This has impacted both absolute and intensity emissions year over year. Whilst absolute emissions have increased 55% compared to the baseline years (mainly as a result of the 70% production increase), emissions intensity has decreased 49% in comparison to the baseline years (2003-2006) as a result of energy efficiency programs and improved capacity utilization.

CFMA CQ will continue to provide an annual update of its GHG emissions inventory.