

CHANGAN FORD MAZDA ENGINE CO., LTD.
长安福特马自达发动机有限公司
(CFME)



2012 Greenhouse Gas Inventory
2012 年度温室气体总量

Executive Summary 摘要:

Changan Ford Mazda Engine Co., Ltd. (CFME) is issuing its fourth greenhouse gas emissions (GHG) report. CFME believes that the starting point of a corporate GHG strategy is to better understand its emissions. CFME is aware of the importance of Climate Change and is committed to the continuous improvement in its environmental performance and sharing the results with others.

长安福特马自达发动机有限公司（以下简称 CFME）现公布第四份温室气体（GHG）排放报告。CFME 相信公司的 GHG 战略出发点是为了更好地了解自身排放情况。CFME 已经认识到气候变化的重要性，并致力于不断提高自身的环境业绩，同时与其它公司分享结果。

Ford is proud to participate in different greenhouse gas management initiatives worldwide including: The Mexican GHG Program, The Australian National Greenhouse Emissions Reporting System (NGERS), The Climate Registry (TCR), The Brazilian GHG Program, The EU Emissions Trading Scheme (EU ETS), and The Canadian GHG Emissions Reporting Program (GHGRP).

福特汽车公司非常荣幸地参与了各种世界 GHG 管理计划，包括芝加哥气候交易所（CCX）、墨西哥 GHG 计划、澳大利亚国内温室排放报告系统、气候登记（TCR）、巴西 GHG 计划、欧盟排放交易计划（EU ETS）以及加拿大温室气体排放报告计划。

The 2012 GHG inventory includes CFME data from 2008-2012. Total emissions increased over 21% from 2011 to 2012 and increased approximately 103% from the 2008 baseline year, due to significant production increases.

2012 年 GHG 总量报告包括 CFME 2008 至 2012 年度的数据。GHG 排放总量从 2011 年到 2012 年上升 21% 以上。由于产量大幅提高，2012 年的排放总量比自基准时期（2008 年）以来上升了 103% 以上。

However, the 2012 emission intensity (per unit) decreased over 25.3% from 2011 and decreased almost 50.1% from the 2008 baseline year..

2012 年排放强度（每单位）比 2011 年下降 25.3%以上，比基准时期（2008 年）以来下降了 50.1%以上。

CFME will provide annual updates as it continues to strive to meet or exceed environmental standards.

CFME 将每年提供更新资料，并继续努力保持和超越自身的环境标准。

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Introduction 介绍

Changan Ford Mazda Engine Co., Ltd. (CFME) is located in Nanjing Jiangning Economical & Technological Zone (30 minutes drive of Nanjing City). It is a three-party joint venture between CQ Changan Automobile Co., Ltd. (50%), Ford Motor Company (25%) and Mazda Motor Corporation (25%).

长安福特马自达发动机有限公司（以下简称 CFME）坐落于南京江宁经济技术开发区（从南京市区开车约 30 分钟）。CFME 是由重庆长安汽车股份有限公司（占 50% 股份）、福特汽车公司（占 25% 股份）和马自达汽车株式会社（占 25% 股份）三方合资兴建。

The engine plant started production in 2007 with an initial annual capacity of 350,000 units and flexible production lines that could be expanded quickly based on future needs. The main products of the company are the Sigma TiVCT, BZ and I4 engines. These engines featured state of the art technology such as Variable Cam Timing VCT, Variable Intake System VIS, Tumble Swirl Control Valve TSCV, and Multi-port Fuel Injection MFI. They are environmentally-friendly and among the top level engine products in China today which makes CFME one of the most advanced engine production bases in the country.

该发动机厂于 2007 年开始生产，其初期的年产能为 35 万台，并可以根据需要迅速扩大产能。公司现有产品主要是 Sigma TiVCT, BZ 和 I4 三大发动机系列。这些发动机采用了多种先进技术，譬如 VCT（可变凸轮正时）、VIS（可变进气系统）、TSCV（进气涡流控制阀）和 MFI（多点电控燃料喷射）。产品不仅环保，而且也是现今中国一流的发动机，从而使得 CFME 成为国内最先进发动机生产基地之一。

The CFME site supports three manufacturing processes: casting, machining and assembly. CFME supplies products to the assembly plants of Chang'an Ford

Automobile Co., Ltd. in Chongqing and Chang'an Mazda Automobile Co., Ltd. In Nanjing. These facilities are not included in this report as separate inventories have been developed for them.

CFME 的三大工艺生产线：铸造、机加和总装。CFME 的产品主要用于重庆长安福特汽车有限公司以及南京长安马自达汽车有限公司的组装厂。这两家工厂将单独计算其排放总量，并未包括在本报告里。

One of the most important initiatives undertaken by CFME 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 CFME's performance is the use of detailed management systems for all resource use (energy, solid and liquid waste and water). Energy targets are set for each operation and monitoring systems are in place in all areas. Performance against targets is taken very seriously and energy engineers report out to senior management on performance against targets on a weekly basis. Other environmental initiatives include: energy efficiency projects and educational programs for employees.

CFME 采取的最重要举措之一是执行了 ISO 14001 环境管理标准，该标准涵盖了工厂环境管理的各个方面，包括大气排放、废物、水和能源。为了维护该认证，工厂必须每年进行一次监督审核以确保工厂达标，同时衡量工厂所取得的进步。CFME 其中一个显著的成效是对资源利用（包括：能源、固体和液体废物、溶液和水）进行细致的体系化管理。厂内所有场所均有安装监测系统，并对每个工艺提出能源目标。工厂对目标能耗的达标要求十分严格，能源工程师每星期直接向高级管理层汇报成效。其它环境计划包括：节能项目和员工教育计划。

CQ Changan Automobile Co., Ltd, Ford Motor Company, and Mazda Motors recognize the importance of the climate change issue and will continue to work on

reducing GHG emissions of our vehicles and facilities by way of introducing advanced technology vehicles and improving energy-efficiency in manufacturing operations.

重庆长安汽车股份有限公司、福特汽车公司和马自达汽车株式会社认识到气候变化问题的重要性，并将通过引进含有先进技术的汽车和提高生产过程中的能效来继续减少其汽车和工厂的 GHG 排放。

CFME in Nanjing CFME 在南京

Product: BZ, I4 Engines

Founded: September, 2005

Plant Capacity: 350,000 units/year

Operation: Casting, Machining and Assembly

Employees: 2,372 employees (Dec 31st, 2012)

Area: 87,284 m²

ISO 14001 Certified: February 2009

产品: BZ 发动机系列、I4 发动机系列

成立时间: 2005 年 9 月

产能: 35 万台每年

工艺: 铸造、机加和总装

员工人数: 2,372 人 (2012 年 12 月 31 日)

面积: 87,284 平方米

ISO 14001 认证时间: 2009 年 2 月



Figure 1: BZ Engine
图 1: BZ 发动机



Figure 2: I4 Engine
图 2: I4 发动机



Figure 3: Sigma Engine
图 3: Sigma 发动机

Corporate Climate Change Initiatives 集团气候变化管理计划

CFME is proud to be one of the first engine production companies to voluntarily report its GHG emissions in Mainland China. We believe that climate change is a serious environmental issue and recognize that it is not possible to wait for all the scientific uncertainties to be resolved. Ford Motor Company is actively participating in various programs around the world gaining considerable experience in GHG reporting. Some of the initiatives are listed below:

CFME 是中国大陆第一批自愿公布其 GHG 排放的汽车发动机公司之一，为此我们感到非常骄傲。我们相信气候变化是一个严重的环境问题，并认为我们不能等待所有的科学不确定性明朗以后再来行动。福特汽车公司正积极地参与全世界各种 GHG 计划并获得了一定的 GHG 报告的经验。以下是我们参与过的部分 GHG 管理计划：

Chicago Climate Exchange (CCX)

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

芝加哥气候交易所 (CCX)

芝加哥气候交易所 (CCX) 是北美地区的 GHG 减排与交易系统。CCX 是由会员设计和治理，自愿形成的一套交易体系。这些成员自愿地通过法律约定的承诺在 2010 年前，基于 2000 年的基准值消减 GHG 排放量 6%。福特汽车公司是第一家，也是唯一一家参与这个计划的汽车制造公司。这个交易所已于 2010 年 11 月关闭。

Mexico GHG Pilot Program

The Mexico GHG Program started as a 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.

墨西哥 GHG 试验计划

墨西哥 GHG 试验计划是由 La Secretaria de Medio Ambiente y Recursos Naturales (SEMARNAT)、世界资源研究所 (WRI) 和世界可持续发展工商理事会 (WBCSD) 发起的为期两年的合作计划。作为一个自愿性计划，墨西哥 GHG 试验计划的成立旨在协助墨西哥企业计算其 GHG 排放量。福特汽车公司是唯一一家参与该计划的第一阶段的汽车制造企业，并承诺每年报告其排放量。

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. Details of the third phase of the program, beginning in 2013, are currently being finalized.

欧盟排放权交易方案(EU ETS)

福特汽车公司参与的 EU ETS 于 2005 年 1 月正式启动，是欧洲减少二氧化碳和其它 GHG 排放的方针的其中一个。该方案的第二阶段于 2008 年到 2012 年实施，这一时期也是《京都议定书》首次正式实施的时间。该方案的第三期最近已经完成，由 2013 年开始。

Canadian Voluntary Challenge and Registry

Ford voluntarily reported GHG emissions to the Canadian Voluntary Challenge and Registry (VCR) from 1999 to 2006. Over the years, it 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. The Challenge Registry ceased taking submissions effective, January 1, 2012. Ford now participates in the Canadian Greenhouse Gas Reporting Program.

加拿大 GHG 挑战与登记

从 1999 年起到 2006 年，福特汽车公司自愿向加拿大 GHG 挑战与登记（VCR）报告其年度 GHG 排放量。时至今日，福特汽车公司已经在 VCR 的报告系统里取得最高级别的成绩，包括获得汽车行业两次领导力奖，1999 年获得报告银奖以及在 2000~2003 年，2005~2006 年报告金奖。加拿大挑战与登记已经于 2012 年 1 月 1 日停止。福特汽车公司现正参加加拿大温室气体报告计划。

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. Ford ceased operations in the Philippines in 2012 and will therefore no longer participate in the program.

菲律宾 GHG 计划

菲律宾 GHG 计算与报告计划（PhilGARP）由马尼拉天文台的 Klima 气候变化中心、菲律宾环境商务部、环境与自然资源部、能源部、WBCSD 和 WRI 于 2006 年 11 月联合发起。福特于 2012 年关闭了菲律宾工厂，也不再参与菲律宾 GHG 计划。

The Climate Registry (TCR)

The Climate Registry is a nonprofit organization that establishes consistent, transparent standards throughout North America for businesses and governments to calculate, verify and publicly report their carbon footprints in a single, unified registry. Ford became a founding member in 2008 and was the first auto manufacturing participant in the program. In 2011, Ford became a Climate Registered member of TCR with the independent third party verification of all of Ford's North American GHG emissions.

气候变化注册组织 (TCR)

北美的气候变化注册组织（TCR）提供精准和透明的 GHG 排放测量方法，并保证各行业和地区使用一致的度量法。气候变化注册组织的下属统计机构即支持自愿的，也支持法定的管理计划。福特汽车公司是气候变化注册组织的创始成员，也是第一家加入该组织的汽车制造商。福特在 2011 年由独立第三方验证了所有福特北美温室气体排放量之后，成为气候变化组织的注册成员。

Brazilian GHG Reporting Program

The Brazil Greenhouse Gas program is a partnership of Brazil's Ministry of Environment, the Brazilian Business Council for Sustainable Development, the Fundação Getúlio Vargas, the World Business Council on Sustainable Development, and the World Resources Institute (WRI). Ford of Brazil is proud to be the first automobile company in Brazil to voluntarily report its Facility Greenhouse Gas (GHG) emissions.

巴西 GHG 报告计划

巴西 GHG 计划由巴西环境部、巴西可持续发展商业理事会、the Fundação Getúlio Vargas、WBCSD 和 WRI 共同发起。巴西的福特汽车公司是巴西国内第一家自愿报告其 GHG 排放量的汽车制造商。

Methodology 方法

CFME 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 the facility. The emissions data reported was generated following the GHG calculation tools developed by the World Resources Institute (WRI). Please note that the most up to date 2008 WRI electricity emission factors are used for the 2008~2012 CO₂ emission calculations.

CFME 运用最高等级的能源监控系统 and 行业领先的全球排放管理 (GEM) 数据库, 以确保环境因素例如二氧化碳排放量得到持续一致的跟踪。本报告的所有能源数据均包含在 GEM 里, 并通过工厂进行跟踪和修正。本报告的排放数据是通过世界能源研究所 (WRI) 建立的 GHG 计算工具计算得出。请注意 2008 年至 2012 年二氧化碳排放的计算是基于最新的 2008 年电排放系数。

This report includes "direct" emissions characterized as scope 1 in the WRI/WBCSD protocol and "indirect" or scope 2 emissions from the same protocol. All CO₂ emissions are included and reported in units of metric tons of carbon dioxide (CO₂). Other GHG applicable to combustion processes, CH₄ and N₂O, are estimated to be less than 1% of the total emissions and hence considered negligible. Other emission sources such as HFCs from refrigerant leakages are also considered minimal at less than 1.7% of total emissions. PFCs and SF₆ do not apply to the company's manufacturing facilities. Emission factors in Table 1 were used to calculate CO₂ emissions.

本报告包括由 WRI 和 WBCSD 协议里定义为范围一直接排放源和范围二的间接排放源。报告里所有的二氧化碳排放量单位均为公制吨二氧化碳当量。其它 GHG, 例如甲烷和一氧化二氮的排放估量在总排放量的 1% 以下, 因此忽略不计。其它排放源, 如在

汽车空调初填充制冷剂时渗漏的含氟烃类，其排放量可视为总排放量 1.7%以下。本公司的制造工厂没有使用到全氟烃类和六氟化硫。表 1 里的排放指标是用作二氧化碳排放量的计算。

Table 1: Emission Factors

表 1：排放指标

Fuel 燃料	Factor 排放指标
Natural Gas 天然气	<i>0.001885tCO₂/m³</i>
Gasoline/Petroleum 汽油/石油	<i>0.002272tCO₂/l</i>
Diesel 柴油	<i>0.002676CO₂/l</i>
Electricity (2008) 电 (2008)	<i>0.0008268tCO₂/KWh</i>
Note: From WRI/WBCSD 来源：WRI和WBCSD	

Base Year 基准年

CFME was established in 2005 and began production in 2007. As other years are not representative of our operations due to launch phase and the low historical production volumes, we have selected 2008 year as our representative baseline going forward. Table 2 shows the direct and indirect emissions used to obtain the baseline. Direct Emissions result from combusting fuels at the CFME site including natural gas and gasoline. Please note that diesel was also introduced in the plant since 2010. Indirect Emissions are those generated off site but attributable to manufacturing (i.e. electricity used on site).

CFME 成立于 2005 年，并于 2007 年开始投产。我们选择 2008 年作为我们的基准年，此前年份由于产量低而不具有代表性。表 2 显示了用作计算基准年的直接和间接排放。CFME 的直接排放包括如燃烧天然气以及汽油。请留意从 2010 年开始工厂开始记录柴油的用量。间接排放代表那些并不在厂区产生但归于制造的排放（如厂区用电）。

Table 2: Direct and Indirect Emissions Baseline**表 2：直接和间接排放基准值**

Direct Emissions (metric tCO₂) 直接排放 (吨 CO₂)	Indirect Emissions (metric tCO₂) 间接排放 (吨 CO₂)	Production 产量
2008 年	2008 年	2008 年
3,181	19,216	71,362

GHG Emissions Data GHG 排放数据

CFME was constructed with state of the art technology that allows the plants to operate in an energy efficient manner. CFME's internal energy management and control process allows the plants to monitor energy usage throughout the facilities and identify areas that can be improved.

CFME 运用最先进的技术建造工厂使其运作可以达到高效节能。CFME 的内部能源管理和控制流程可以监控工厂内各部门的能源使用并识别出可以改进的地方。

Table 3 below summarizes CFME energy consumption from 2008-2012.

表 3 汇总了 CFME 2008-2012 年度的能耗。

Table 3: CFME Energy Consumption From 2008-2012

表 3: CFME2008-2012 年能耗

Period 年份	Natural Gas (m ³) 天然气 (m3)	Gasoline (l) 汽油 (l)	Diesel (l) 柴油 (l)	Electricity (KWH) 电 (KWH)
2008	1,597,705	73,077	0	23,241,765
2009	2,528,184	80,955	0	35,474,474
2010	2,611,912	68,192	0	40,310,011
2011	2,628,688	111,925	980	38,943,567
2012	3,198,628	177,531	2480	47,116,487

Direct Emissions:

Direct Emissions result from combusting fuels at the CFME site including natural gas, gasoline and diesel.

直接排放:

CFME 的直接排放来自燃烧天然气，汽油以及柴油的排放。

Indirect Emissions:

CFME Indirect Emissions include all emissions generated outside the site's perimeter such as emissions from burning fossil fuel to generate electricity. CFME continuously monitors its electricity consumption. However the rate of energy consumption depends heavily on production, and if production increases, so will energy consumption. Table 4 shows the total direct and indirect emissions from 2008 - 2012 by year.

间接排放:

CFME 的间接排放包括厂外产生的全部排放，例如用来发电的化石燃料。CFME 长期监控其用电量。但是用电量受生产影响较大，生产量加大，用电量也随之增大。表 4 显示了工厂 2008—2012 年的直接，间接排放量以及排放强度。

Table 4: CFME Total Emission and Emission Intensity
表 4: CFME 排放总量及排放强度

Year 年份	Total Emission (tCO ₂) 排放总量 (吨 CO ₂)		Emission Intensity (tCO ₂ /unit) 排放强度 (吨 CO ₂ /车)
	Direct Emissions (tCO ₂) 直接排放 (吨 CO ₂)	Indirect Emissions (tCO ₂) 间接排放 (吨 CO ₂)	
2008	3,181	19,216	0.31
2009	4,952	29,330	0.20
2010	5,078	33,328	0.18
2011	5,212	32,198	0.21
2012	6,439	45,395	0.16

Disclaimer: The calculation is based on electricity emission factors provided by WRI every year. Please note that the most up to date 2008 WRI electricity emission factors are used for the 2008~2012 CO₂ emission calculations..
 注：所有排放总量的计算都是基于 WRI 每年更新的系数。请注意 2008 年至 2012 年二氧化碳排放的计算是基于最新的 2008 年电排放系数。

Data Analysis 数据分析

While the CFME site experienced a 62% increase in production from 2011 to 2012, the total absolute emissions increased approximately 21%. Also, compared to the 2008 baseline period, the total absolute emissions increased approximately 103%, due to significant production increases. Figure 3 below shows CFME Absolute Emissions trends from 2008 to 2012.

CFME 2012 年的产量比 2011 年增长了 62%，排放总量也相应上升 21%以上，由于产量大幅上升，2012 年的排放总量比基准时期（2008 年）上升 103%。图 3 显示了 CFME 从 2008 年至 2012 年排放总量的趋势。

Emission intensity is calculated by dividing absolute emissions by the number of production units (engines built). As shown in Figure 4, 2012 emissions intensity (per unit) decreased approximately 25.3% from 2011 and decreased approximately 50.1% from the 2008 baseline period.

排放强度的计算是基于排放总量除以生产单位的个数（即发动机）。如图 4 所示，2012 年的排放强度（每单位）比 2011 年起下降了 25.3%，比基准时期（2008 年）降低 50.1%。

Figure 4: CFME Total GHG Emissions
图 4: CFME GHG 排放总量

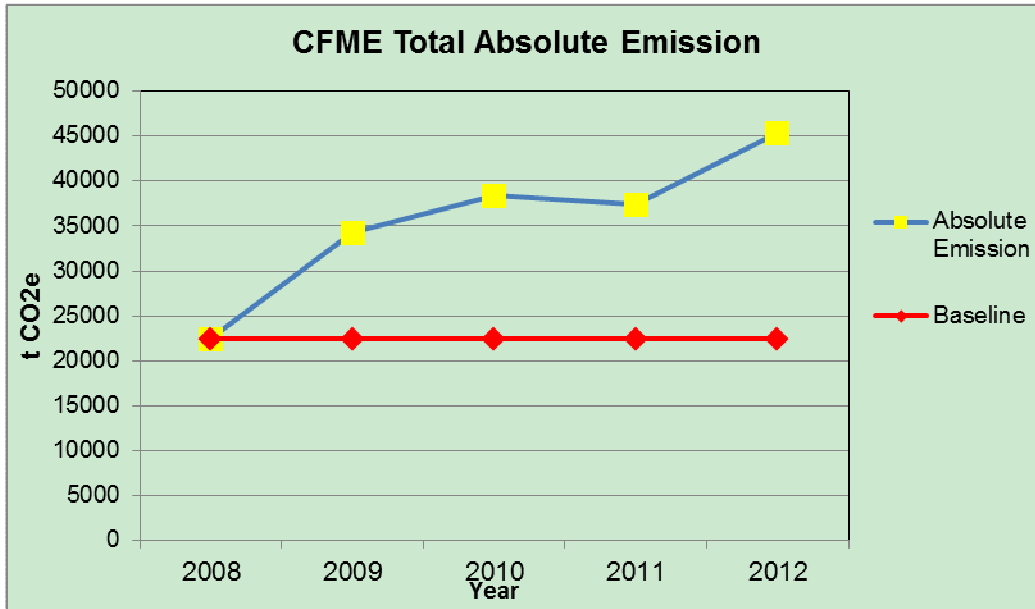
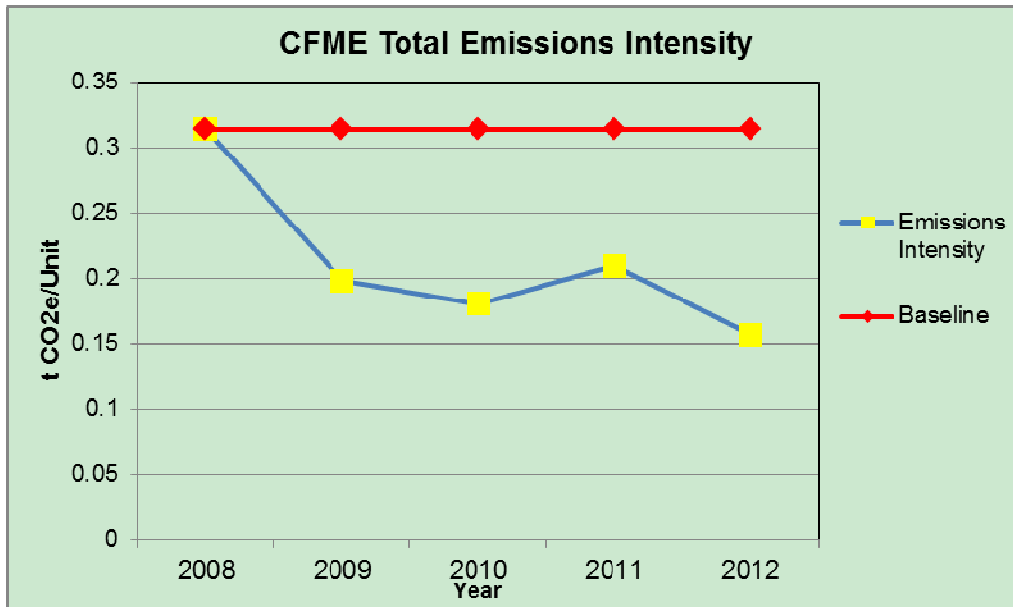


Figure 5: CFME GHG Emissions Intensity
图 5: CFME GHG 排放强度



Conclusions 结论

CFME is proud to present its fourth GHG emissions inventory building upon the prior achievement of becoming the first automobile company in Mainland China to voluntarily report its facility GHG emissions. CFME recognizes the importance of the climate change issue and supports emissions reporting at a national level. CFME is committed to improving energy efficiency, reducing GHG emissions, and maintaining and exceeding its environmental standards.

CFME 作为中国大陆首家自愿公布其工厂 GHG 排放的汽车公司，现隆重发布第四份 GHG 排放总量报告。CFME 认识到气候变化问题的重要性，并在国家层面上支持 GHG 排放的公布。CFME 致力于提高能效，减少温室气体排放，同时保持并超越自身的环境标准。