

CHANGAN FORD MAZDA ENGINE CO., LTD.

长安福特马自达发动机有限公司

(CFME)



2009 Greenhouse Gas Inventory

2009 年度温室气体总量报告

Executive Summary:

Changan Ford Mazda Engine Co., Ltd. (CFME) is issuing its second 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 it is committed to constantly improving its environmental performance and sharing results with others.

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

This GHG inventory includes 2008 and 2009 data. Total CO₂ emissions increased from 22,913 tons in 2008 to 35,070 tons in 2009 due to a significant increase in production. 2009 production was more than two times higher than 2008. Emissions intensity decreased from 0.32tCO₂/unit in 2008 to 0.20tCO₂/unit in 2009. Emissions intensity is expected to continue to decrease over time as production increases. Production is expected to increase significantly over the next years with the launch of new products. CFME will provide annual updates to this report and analyze data trends.

摘要:

长安福特马自达发动机有限公司（以下简称 CFME）现公布第二份温室气体（GHG）排放报告。CFME 相信一个公司的 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。

在全球范围内，福特汽车公司非常荣幸地参与了多个国家的 GHG 管理计划，包括芝加哥气候交易所（CCX）、墨西哥 GHG 计划、菲律宾 GHG 核算与报告计划（PhilGARP）、澳大利亚国内温室排放报告系统、气候登记（TCR）、巴西 GHG 计划、欧盟排放贸易计划（EU ETS）以及加拿大 GHG 挑战登记。

本 GHG 总量报告包括 2008 年度和 2009 年度的数据，由于 2009 年产量大幅增长，2009 年的二氧化碳总排放量也由 2008 年的 22,913 公吨增加到 35,070 公吨。2009 年的产量超过 2008 年产量的两倍以上，而排放强度则从 2008 年的 0.32 吨二氧化碳每单位下降到 0.20 吨二氧化碳每单位。该排放强度有望随着产量提高而不断有所下降。在未来的几年里，随着新产品的推出，产量势必会显著增加。CFME 将提供其年度更新报告并分析数据走势。

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Introduction

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%).

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 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.

The CFME site supports three manufacturing processes: casting, machining and assembly. CFME supplies products to the assembly plants of Changan Ford Mazda Automobile Co., Ltd. in Chongqing and Nanjing. These facilities are not included in this report as separate inventories have been developed for them.

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, 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.

介绍

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。

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 BZ 和 I4 两大发动机系列。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（进气漩涡控制阀）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 CFME 成为国内最先进发动机生产基地之一。

CFME 的三大工艺生产线：铸造、机加和总装。CFME 的产品主要用于长安福特马自达汽车有限公司在重庆和南京的组装厂。这两家工厂将单独计算其排放总量，并未包括在本报告里。

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.

CFME in China

Product: BZ, I4 Engines

Founded: September, 2005

Plant Capacity: 350,000 units/year

Operation: Casting, Machining and Assembly

Employees (2009): 1,622 employees

Area: 87,284 m²

ISO 14001 Certified: March 2008



Figure 1: BZ Engine

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 在中国

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 (2009 年) : 1,622 人

面积: 87,284 平方米

ISO 14001 认证时间: 2008 年 3 月



图 1: BZ 发动机



Figure 2: I4 Engine

Corporate Climate Change Initiatives

CFME is proud to be one of the first engine production companies to voluntarily report its GHG emissions in 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:

CFMA Chongqing – China:

CFMA CQ was the first automotive company in China to voluntarily report its GHG Emissions in April of 2008. 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



图 2: I4 发动机

集团气候变化管理计划

CFME 是中国第一批自愿公布其 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采取行动。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：

CFMA 重庆 – 中国：

CFMA 重庆于 2008 年 4 月成为中国第一家自愿公布其 GHG 排放的汽车制造公司。我们希望和世界范围内的其它公司和行业分享我们的 GHG 经验。

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。

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 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.

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)

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汽车制造公司。

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。

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 排放的方针的其中之一。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。随后会又有一个五年方案。

加拿大 GHG 挑战与登记:

从 1999 年起，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，包括两次获得汽车制造行业领导力奖，此外还获得 1999 年度银牌报告者称号以及 2000 - 2003 年度、2005 年度和 2006 年度金牌报告者称号。

菲律宾 GHG 计划：

菲律宾 GHG 计算与报告计划(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.

The Climate Registry (TCR)

The Climate Registry in North America provides accurate and transparent measurement of GHG emissions and ensures consistency of measurement metrics across industry sectors and borders. The Climate Registry accounting infrastructure supports both voluntary and regulatory programs. Ford is a founding member and the first automaker to participate in the program.

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.

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.

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).

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。

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。

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。

方法

用来计算基准值和报告年的数据是直接来自公用事业机构所出具的电费和天然气费发票。

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。

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% 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.

Table 1: Emission Factors

| Fuel | Factor |
|--------------------|---|
| Natural Gas | <i>0.001884tCO₂/m³</i> |
| Gasoline/Petroleum | <i>0.0023403tCO₂/l</i> |
| Electricity | <i>0.000849tCO₂/KWh</i> |

*From WRI/WBCSD

Base Years

CFME was established in 2005 and began production in 2007. This inventory includes 2008 and 2009 data as other years are not representative of our operations due to launch phase and the low historical production volumes. Table 2 shows CFME energy consumption for 2008 and 2009.

本报告包括由 WRI 和 WBCSD 协议里定义为范围一-的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。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%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。

表 1: 排放指标

| 燃料 | 指标 |
|-------|------------------------------------|
| 天然气 | <i>0.001884吨二氧化碳/米³</i> |
| 汽油/石油 | <i>0.0023403吨二氧化碳/升</i> |
| 电 | <i>0.000849吨二氧化碳/千瓦时</i> |

*来源：WRI/WBCSD

基准年

CFME 成立于 2005 年，并于 2007 年开始投产。本总量报告包括了 CFME2008 年度和 2009 年度的数据，此前年份由于产量低而不具有代表性。表 2 分别显示了 CFME2008 年度和 2009 年度的能耗。

Table 2: CFME Energy Consumption

| CFME Energy Consumption | | |
|--------------------------------|------------|------------|
| | 2008 | 2009 |
| Natural Gas (m3) | 1,597,705 | 2,528,184 |
| Gasoline/Petroleum (liters) | 73,077 | 80,955 |
| Electricity (KWh) | 23,241,765 | 35,474,474 |
| Production Units | 70,480 | 173,330 |

Note that the production for 2008 is slightly lower than reported in the previous report, but this change does not affect the emissions intensity.

GHG Emissions Data

Direct Emissions result from combusting fuels at the CFME site including natural gas and gasoline. Indirect Emissions include all emissions generated outside the site's perimeter such as emissions from burning fossil fuel to generate electricity.

Table 3 shows absolute Direct and Indirect GHG emissions for 2008 and 2009.

Table 3: Total CFME Absolute Emissions

| CFME Absolute Emissions | | |
|---------------------------------|--------|--------|
| | 2008 | 2009 |
| Direct Emissions (tCO2) | 3,181 | 4,953 |
| Indirect Emissions (tCO2) | 19,732 | 30,118 |
| Total Absolute Emissions (tCO2) | 22,913 | 35,070 |

Emission intensity is calculated by dividing absolute emissions by the number of production units (engines built). CFME emissions intensity for 2009 is 0.20tCO2/unit, a significant decrease from 0.32tCO2/unit in 2008. Emissions intensity is expected to continue to decrease over time as production increases. Production is

表 2: CFME 能耗

| CFME 能耗 | | |
|-----------|------------|------------|
| | 2008 年 | 2009 年 |
| 天然气 (立方米) | 1,597,705 | 2,528,184 |
| 汽油/石油 (升) | 73,077 | 80,955 |
| 电 (千瓦时) | 23,241,765 | 35,474,474 |
| 生产单位 | 70,480 | 173,330 |

值得注意的是，2008 年的产量略低于上份报告，但是该变化并不影响排放强度。

GHG 排放数据

CFME 的直接排放来自燃烧天然气或者其它石油类燃料的排放，间接排放包括厂外产生的全部排放，例如燃烧发电用的化石燃料产生的排放。

表 3 显示了 CFME 2008 年度和 2009 年度的 GHG 绝对直接排放和间接排放。

表 3: CFME 总绝对排放

| 2008 CFME 总绝对排放 | | |
|-----------------|--------|--------|
| | 2008 年 | 2009 年 |
| 直接排放 (吨二氧化碳) | 3,181 | 4,953 |
| 间接排放 (吨二氧化碳) | 19,732 | 30,118 |
| 总绝对排放 (吨二氧化碳) | 22,913 | 35,070 |

强度的计算是基于绝对排放除以生产单位的个数（即汽车）。CFME 2009 年度的排放强度为 0.20 吨二氧化碳每单位，比 2008 年度的 0.32 吨二氧化碳每单位有明显的下降。排放强度有望随着产量增加而逐渐减小。

expected to increase significantly over the next years with the launch of new products. A detailed analysis will be provided next year as more data becomes available.

Conclusions

CFME is proud to be one of the first engine production companies in China to voluntarily report its 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. Total CO₂ emissions increased from 22,913 tons in 2008 to 35,070 tons in 2009 due to a significant increase in production. 2009 production was more than two times higher than 2008. Emissions intensity decreased from 0.32tCO₂/unit in 2008 to 0.20tCO₂/unit in 2009. CFME is committed to providing annual updates to the program.

在未来的几年里，随着新产品的推出，产量势必会显著增加。当获得更多的数据以后，明年将提供更为详尽的数据分析。

结论

CFME 作为中国首批自愿公布其 GHG 排放的汽车发动机制造公司之一，我们感到非常骄傲。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。由于 2009 年产量大幅增长，CFME 2009 年度的二氧化碳总排放量从上年的 22,913 公吨上升到 35,070 公吨。2009 年的产量是 2008 年的两倍多，而排放强度则从 2008 年的 0.32 吨二氧化碳每单位下降为 0.20 吨二氧化碳每单位。此外，CFME 还承诺将每年提供更新的排放报告。