携手中国
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卡特彼勒积极致力于
将“中国智慧”研发的创新技术惠及全球

长久以来，重制造、轻研发的发展模式阻碍着中国工程机械行业的发展。卡特彼勒自进驻中国，一直将提升自主创新能力和更好地满足中国及新兴市场的客户需求为发展要求和目标。为实现在中国的长远发展，卡特彼勒中国首家研发中心于2005年应运而生。如今，它已成为卡特彼勒全球第二大综合研发机构，凭借完整的研发体系，向世人展现着惊人的研发、生产效率和上乘的质量，而这些成就归功于企业用心培养的本土领导及创新精英的不懈努力。卡特彼勒的“中国智慧”正在中国及亚太成长型市场熠熠生辉，并将为推动其全球发展绽放更耀眼的光芒。

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CATERPILLAR®
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集中国智慧 展现中国式创新魅力

——记卡特彼勒中国研发中心

2012 年 11 月，卡特彼勒的全新产品 986H 大型轮式装载机 (http://www.cmen.cc/2012/equipment_1127/25120.html)首次亮相上海 BAUMA 展 (http://news.d1cm.com/2012/12/06/120609311938973.shtml)。这款产品是在中国设计、由中国生产、从中国首发、向全球发布的一款产品。它从设计到研发到验证到生产，仅用短短两年半时间，而在国外，这一过程通常需要 4-5 年。

创造这一“不可能完成任务”的，是卡特彼勒中国研发中心。

中国速度

每个跨国公司进入中国后都需要直面这样的问题：如何在产品研发、运营和服务上解决本地化问题。进入中国市场四十多年来，卡特彼勒深深地融入了中国市场，成为中国市场上有机的组成部分。为了更好地服务于这块蓬勃的市场，很早以前，卡特彼勒就有一个想法：在中国建立一个研发中心，将各个不同功能的团队整合在一起，针对中国市场的个性需求，开发全新的适合中国的产品，以满足中国及类似新兴市场客户的需求。

为了实现这个想法,卡特彼勒技术研发（中国）有限公司 2005 年在北京注册成立，而中国研发中心真正的全面发展和壮大是始于 2009 年 12 月 2 日无锡研发中心的正式运营 (http://v.cctv.com/html/media/xinwenlianbo/2009/03/xinwenlianbo_300_20090327_11.shtml)。无锡一期项目于 2009 年投入运营，投资额 5300 万美元，建筑面积约 1 万平方米，包括一个完整的发动机实验中心、材料实验中心、电子电气实验室、整机和系统集成中心等。

随着研发业务的发展需要，2011 年，卡特彼勒技术研发（中国）有限公司将总部迁往无锡。从此，无锡研发中心成为卡特彼勒中国的研发大本营。卡特彼勒中国研发中心也开始进入飞速发

展的“快车道”。

在 2012 年，卡特彼勒中国研发中心再度增资，投资额度达 1.28 亿美元，三期项目也在同年 6 月投入使用。同年，通过 986H 大型轮式装载机，卡特彼勒中国研发中心向世人展示了“中国速度”。

创新生态体系

支撑着卡特彼勒中国研发中心的“中国速度”，并使其发挥到极致的现实基础，是一个完整的研发生态体系 (http://finance.china.com.cn/roll/20130704/1610110.shtml)。

从 2009 年在研发中心旗舰分部无锡研发中心的正式运营以来，卡特彼勒已经在中国打造了完整的研发体系，为中国乃至整个亚洲和世界提供源源不断的技术支撑。

2013 年 1 月，卡特彼勒亚太试验场在江苏南通正式投入运营，四期项目也在 2013 年 11 月正式投入运营。自此，卡特彼勒在中国建立起了包括无锡研发总部，位于青岛、天津的研发分部和南通的亚太试验场的完整研发体系。该研发体系与卡特彼勒在全球的研发体系接轨并共享资源，并承担起为新兴市场研发产品的重任，此外，卡特彼勒研发中心距生产基地和供应商家之间的地理距离大多在两个小时的车程之内，为达成最好的沟通效率提供了现实基础，至此，卡特彼勒中国研发中心初步整合了以研发中心为主体、上下游供应商和生产商、以及客户、外面研发资源的完整的创新研发生态系统。正是这样紧密高效的创新生态系统，确保了卡特彼勒中国研发中心的工作能够高速高效地运转，使得卡特彼勒中国研发中心不仅具有创新能力，还有把创新迅速变成现实的能力。

以 986H 大型轮式装载机为例，卡特彼勒中国研发中心根据市场和客户的需求、以本土的整机、系统、部件研发团队为基础进行无缝合作，在短时间内就完成了各项开发和验证工作，通过内部的供应链开发团队积极开发合格的供应商、并在本地的制造基地和亚太试验场完成整机样机的制造和测试流程，通过在研发、生产、工艺、设计等领域共同集思广益，共同开发，全力发挥

合作伙伴研发资源的优势使得在短短 2 年半内就完成了 986H 整机的研发工作。

目前，卡特彼勒在中国的研发范围包括从几十匹马力到 3500 匹马力的柴油机的开发和测试；整车集成研发；燃油系统的研发和实验；电子电气、材料、冷却和后处理的研发和实验。研发中心还拥有进行翻滚保护实验、液压元件和系统实验的能力，以及工程机械行业首个虚拟现实实验室。2012 年，无锡研发中心获得了中国财政部、税务总局、商务部、发改委、科技部五部委联合颁发的《技术先进型服务企业》证书。

现在的卡特彼勒中国研发中心是美国本土以外最大的综合性研发机构，是卡特彼勒公司在中国研发资源的中枢，为在中国及成长型市场的卡特彼勒各分部提供产品和工艺开发、产品验证、本地化和技术培训、知识产权管理、人力资源、IT 支持等共享服务，为中国及其他亚洲成长型市场提供技术支持。

本土化人才培养

推动“中国速度”的核心力量来源于卡特彼勒在中国打造的本土创造能力，这也是其中国研发中心的魅力所在。而为卡特彼勒的中国式创新提供永动力的，是其完整的本土化人才培养机制。

目前，卡特彼勒在中国大约有 1200 名工程技术研发人员，其中本土人才的比例达到 98%，其中 60%以上的本土人才是由自己培养出来的。这些人才有的是从学校一毕业就招入研发中心，通过几年的培养，现在已经成长为一个团队的领导；有的是在国外留学毕业后，选择回国并加入研发中心，经过多年有目的的培养发展，成为骨干力量。这个数字说明了卡特彼勒在中国已经建立了一个完整的、培养本地的技术和领导人才的机制。

在大学层面，卡特彼勒与中国的全日制重点大学高校建立战略合作，和包括北京大学、上海交通大学在内的全国 12 所重点高校建立战略合作关系。同时，卡特彼勒在东北、山东、陕西、湖北、江苏与当地高校均有不同形式的合作，如设立奖学金，举行有关机械类专业讲座，以及通过直接的合作项目发掘培养人才。卡特彼勒产品开发及全球技术事业部总监、卡特彼勒技术研发

（中国）有限公司董事长孙晓波博士(http://baike.baidu.com/subview/1323714/8796216.htm) 就身兼武汉理工大学和江南大学的客座教授(http://xinwen.jiangnan.edu.cn/news/2013/1108/13691.html)，帮助卡特彼勒尽早发现和培养人才。在未来人才的培养上，卡特彼勒研发中心与初中和高中阶段的学生进行接触，培养他们在工程方面和知识创新上的兴趣。在无锡，卡特彼勒的工程技术人员就曾作为志愿者前往当地的 6 所中学，指导学生参加机器人大赛，激发他们对工程领域的兴趣。未来，无锡研发中心还计划通过中美大学合作项目，选拔品学兼优的学生在完成学业后到研发中心实习工作。

对进入卡特彼勒中国研发中心的员工，卡特彼勒针对不同的对象，有不同的培养计划。比如卡特彼勒的“Leadership & Technical Development Program(领导力与技术发展项目，以下简称 LTDP 项目)”就是一个打造下一代行业的领导者和技术专家的项目。LTDP 项目通过为招募优秀的应届毕业生，并为每位学员量身定做的轮岗计划，来开发员工的领导力，并打造其深度的技术能力，帮助其迅速成长为一位熟悉行业的技术专家。多年来，卡特彼勒在这个项目上，投入了巨大的人力和财力，每年均有数十人从这个项目中毕业。

在针对本土领导性人才的培养中，卡特彼勒研发中心会让已经展现出优秀的技术和领导能力的骨干员工参加本土技术领导力培训项目，通过多种方式的培训，使其成为公司发展需要的未来领导力量。

良好的人才培养机制和充满人文关怀的内部氛围，是卡特彼勒研发人才始终保持饱满创造热情的有力保障，也是卡特彼勒在中国市场的长期稳定发展的永恒动力。从这个角度上讲，卡特彼勒中国研发中心堪称中国市场的重中之重。

可以相信，卡特彼勒中国研发中心在将来不仅针对中国及新兴市场进行研究开发，也能够为卡特彼勒全球的发展提供强有力的支持，在全球工程机械市场上展现“中国智慧”（http://news.cntv.cn/program/xwlb/20101119/110580.shtml）的力量，展现“中国式创造”的魅力。

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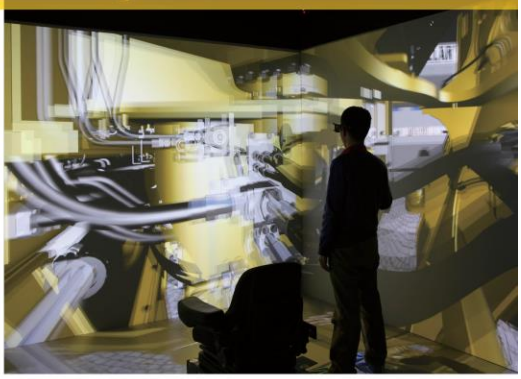

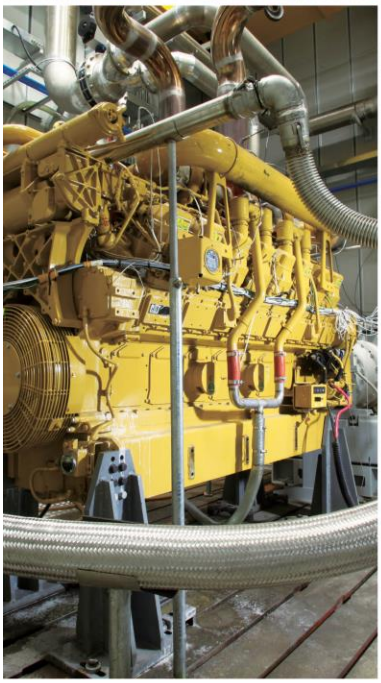

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Dynamic Chinese-style Innovation Drawing on Chinese Technical Intelligence

－Caterpillar China Research & Development Center

In November 2012, Caterpillar's new 986H large wheel loader made its debut at the BAUMA China exhibition in Shanghai. This new machine, aimed at the global market, was designed, manufactured and first released in China. It took only two and a half years for the team in China to complete the whole process, from product design and development to product verification and validation, a process which in other countries usually takes four to five years.

What would elsewhere be considered "Mission Impossible", was accomplished by the Caterpillar China Research & Development Center (CRDC).

China Speed

A challenge every multinational corporation has to face after establishing operations in China is the localization of product development, operations and customer service. Having been in China for over forty years, Caterpillar has become an integral and deeply rooted part of the domestic market. Always aiming to better serve this booming market, Caterpillar wanted from the very beginning to establish a local R&D center to integrate different functional units and to develop brand-new products tailored to the demands of customers based in China and other growth markets.

To achieve this goal, Caterpillar R&D (China) Co., Ltd was incorporated in Beijing in 2005. And with the commencement of operations at the flagship R&D center in Wuxi, Jiangsu Province in December 2009, the actual capacity of China R&D Center was brought into play. After a total investment of $53,000,000 and with a construction area of around 10,000 square meters, the Wuxi R&D center includes a complete engine experiment center, a material experiment center, an electrical and electronics laboratory, and a machine & system integration center.

To meet the needs of business development, the Caterpillar Research & Development Center (China) Co., Ltd. headquarters were relocated to Wuxi in 2011. Since then, it has become Caterpillar's R&D

base in China and has embarked on a sustained period of rapid growth.

In 2012, after a new round of capital increment, total investment in CRDC amounted to $128,000,000. In June 2012, the completion of Phase III of the center's expansion was marked by the opening of new offices and facilities. The same year, CRDC demonstrated to the world how things can be done at "China speed" by introducing its new 986H large wheel loader.

Innovation Ecosystem

What supports CRDC's "China speed" and maximizes its capacity is its innovative R&D ecosystem.

Since 2009 when its Wuxi R&D center was established, Caterpillar has developed a complete China-based R&D mechanism, which has provided steady and continuous technical support for operations in China, Asia and the rest of the world.

Along with the Caterpillar's Asia-Pacific Proving Ground commenced operation in Nantong in January 2013 and Wuxi R&D Center Phase IV facility expansion brought into the fold in November 2013, Wuxi headquarters and the two branches in Qingdao (Shandong Province) and Tianjin form Caterpillar's integrated China R&D system. The China R&D system, through resource sharing with Caterpillar's global R&D network, has assumed responsibility for developing new products for emerging markets. The Caterpillar main R&D center is within two hours' drive from the production bases and the suppliers, which makes for highly efficient system-wide communication. With R&D facilities at the core, CRDC has built a complete innovation ecosystem connecting and integrating upstream and downstream suppliers, producers, customers and external R&D resources. This cohesive and efficient innovation ecosystem has helped guarantee CRDC's speedy and effective operations, not only significantly improving its innovation capacity but also making it possible to move quickly from innovation to materialization.

The 986H large wheel loader is a good example of how CRDC has adapted to market needs and customer demands. Seamless cooperation among local teams in machine design, system and component development, validation and testing helped complete product development and validation in a

remarkably short time. CRDC's internal supply chain development team worked actively to find qualified suppliers. The whole machine prototype manufacturing and testing was conducted in the local manufacturing base and the Asia-Pacific Proving Ground. The expertise and collective efforts of those in research and development, manufacturing, engineering and design, with the invaluable R&D resources of our collaborative partners, made it possible to complete the 986H whole machine research and development in just two and a half years.

Currently Caterpillar's R&D facilities in China are capable of developing and testing diesel engines from several dozen to 3,500 horsepower. Its R&D capacity also includes machine integration and research, fuel systems, electrical and electronics, materials, and cooling and after-treatment. In addition, the R&D center is able to conduct tests for rollover and falling protection and hydraulic components and systems. It also established the first virtual reality laboratory in the construction machinery industry. In 2012 the Wuxi R&D center was certified as a "Technology-Advanced Service Enterprise" by the Ministry of Finance, the State Administration of Taxation, the Ministry of Commerce, the National Development and Reform Commission, and the Ministry of Science and Technology.

Today CRDC is Caterpillar's largest comprehensive R&D center outside the United States. It provides services for Caterpillar's operations in China and other growth markets in product and engineering development, product validation, localization and technical training, intellectual property management, human resources, and IT support, and it extends technical support to China and other growth markets in Asia.

Localization of Personnel Training

The impetus behind CDRC's "China speed" comes from the capacity for innovation which Caterpillar has fostered in the country. And what provides the driving force for Caterpillar's Chinese innovation in the long term is its well-organised local talent development mechanism.

Caterpillar employs around 1,200 R&D engineers in China, among whom 98% are drawn from the local talent pool, and 60% of these are trained in-house. Some of the brightest, recruited immediately upon graduation, have grown into team leaders after several years' training. Some of them, having joined

the R&D unit in China with overseas STEM degrees, have become the backbone of the operation after years of specified training and development. This illustrates the success of Caterpillar's practice of establishing in China a complete talent development pipeline to nurture local technical staff and leadership personnel.

Caterpillar has established strategic cooperative relations with Peking University, Shanghai Jiaotong University and ten other national-level key universities. At the same time in Northeast China and the provinces of Shandong, Shaanxi, Hubei, and Jiangsu, Caterpillar has been cooperating with local colleges and universities, establishing scholarships, organizing professional seminars in mechanical engineering, and developing projects to identify and nurture local talent. Dr. Brian Sun, director of Caterpillar's Product Development & Global Technology Division and Chairman of CRDC, is also a guest professor at Wuhan University of Technology and Jiangnan University, a position which helps him find and develop promising future personnel. Furthering its efforts to train future professionals, CRDC has established contacts with junior and senior high schools to cultivate students' interests in mechanical engineering and technological innovation. In Wuxi, for instance, Caterpillar's engineering and technical staff volunteered at six local high schools, helping the students participate in a robotics competition and sparking their interests in mechanics and engineering. The CRDC is also planning to select outstanding students to participate in China-US university cooperation projects and intern at China R&D center.

CRDC provides specific training and development programs to meet its different objectives. Caterpillar's Leadership & Technical Development Program (LTDP), for example, aims to foster the next generation of leaders and technological experts. After recruiting excellent college graduates, LTDP offers them tailored job rotations to develop their leadership and deepen their technical knowledge, this helps them to grow rapidly into technical experts with a thorough knowledge of the industry. Over the years, Caterpillar has invested a great deal of financial and human resources in this program, and each year dozens of bright trainees pass through it on their way to a promising career.

To develop local leadership talent, CRDC has also tailored local technology and leadership training programs to key mid-career staff who have demonstrated outstanding professional and leadership skills. This rigorous, all-round training prepares them to meet Caterpillar's future leadership needs.

Sound development opportunities and an inclusive corporate culture together guarantee that Caterpillar's R&D staff maintain their passion for innovation, and that they will drive Caterpillar's sustainable development in China in the long term. In this respect, CRDC plays a key role in facilitating Caterpillar's operation in the Chinese market.

It is believed that in the future CRDC will not only undertake research and development for China and other emerging markets, but will also provide strong support to Caterpillar's worldwide operations, in the process of which it will present to the global construction machinery market the spectacle of Chinese technical intelligence and Chinese-style innovation.