



Global Casting Magazine

世界铸造

WWW.GLOBALCASTINGMAGAZINE.COM

JUNE 2023 VOLUME 13 NUMBER 2

微晶铸造设备，您明智的选择
Weijing foundry machines, your wise choice



Looking forward to seeing you
at booth **C02 in Hall16 at GIFA 2023**



WEIJING®

苏州微晶自动化有限公司
SUZHOU WEIJING AUTOMATION CO., LTD

www.weijingsz.com Tel: +86 0512 6610 2545 Email: info@weijingsz.com

Guangdong Fenghua Zhuoli Technology Co., Ltd (FHZL in short), a leading Chinese manufacturer of industrial-grade 3D printers based on binder jetting technology, has been devoted to the innovation and independent R&D of additive manufacturing applications for decades.

FHZL has started to export its intelligent sand casting 3D printers to the overseas market since 2017. Up to now, over 15 machines have been installed in Russia, Belarus, Japan, Brazil, India etc. FHZL is a reliable partner for various foundries, such as automotive, pump&valve, compressor, aerospace&defense, machinery, construction and so on.

FHZL has been contributing constant supports to traditional foundries to meet the challenge of Industry 4.0 with its high-automation, high-efficiency and eco-friendly 3D printing systems.

3D Printed Samples



砂型3D打印机>>>

Sand Casting 3D Printer PCM2200

STRENGTH

Perfect for high-automation production line and rapid series production

Key parts from international brands

Unattended operation with high build speed up to 24 seconds/layer

Comprehensive functions, stable performance

Low production cost, optimization of consumables

Specification

Max build size (mm)	2200*1000*800/1000
Resolution (dpi)	300*400 or 400*400
Printing speed (s/layer)	24
Printing efficiency (L/H)	160
Layer thickness (mm)	0.2-0.5
Printing accuracy (mm)	±0.3
Sand type	Quartz sand, ceramic sand, synthetic sand, CB sand
Binder type	FH-01 (Furan) /FH-02 (Inorganic) /FH-03 (Organic)



PCM2200

Guangdong Fenghua Zhuoli Technology Co., Ltd

Web: www.fhzi.co E-mail: 3dp@fhzi.co

Add: C2-2, No.8 Iizhong Road, Danzao Logistics Center, Danzao Town, Nanhai District, Foshan, Guangdong

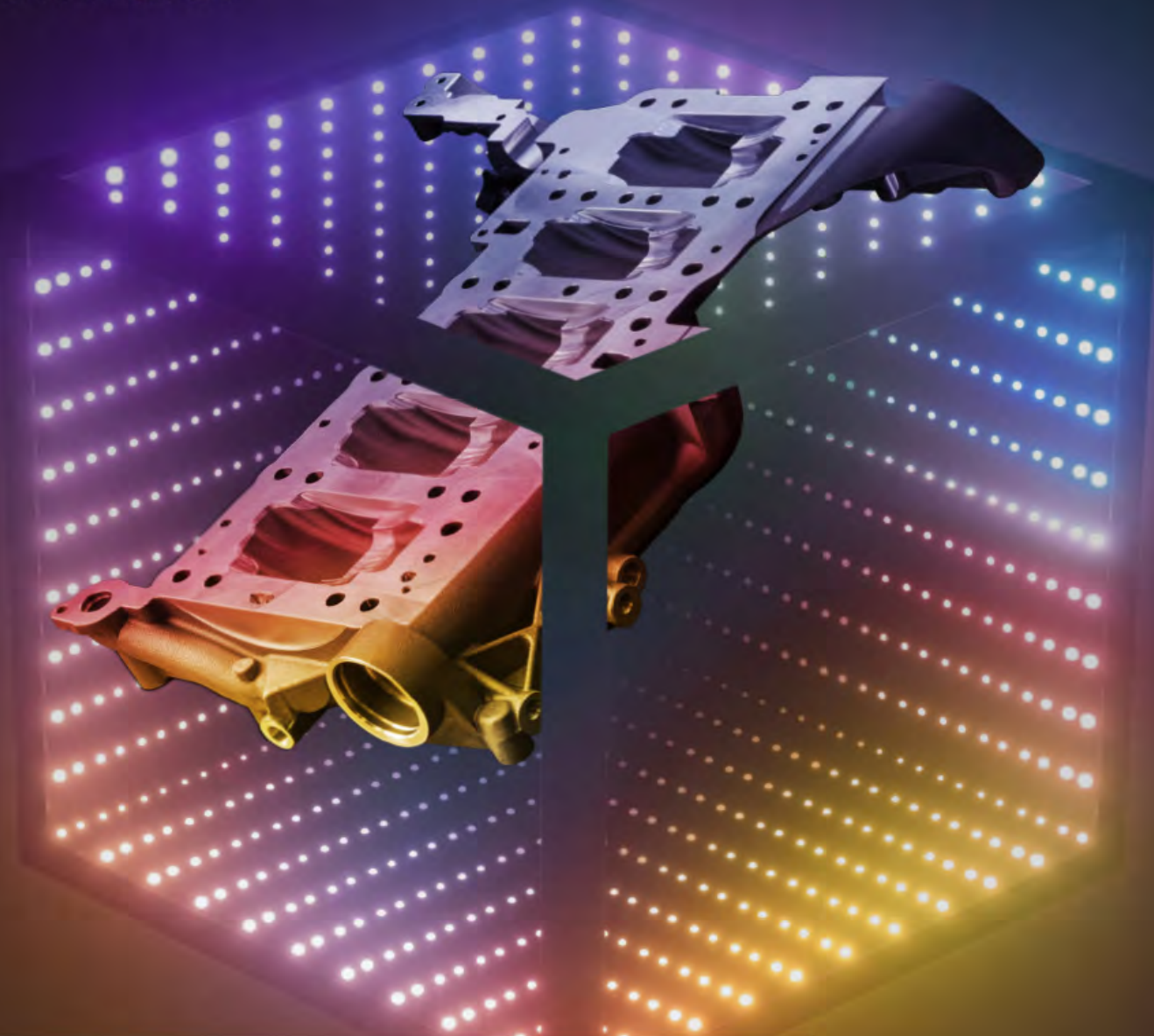
Tel: +86-757-8877 5583



铸造智慧， 尽在MAGMASOFT® 6.0

MAGMA
Committed to Casting Excellence

Casting Knowledge.
In a Software.



时间：6月12-16日
地点：杜塞尔多夫
展位号：12馆A19-20

12 - 16 June 2023

Dusseldorf
Hall 12
Booth A19 - A20



迈格码官方微信

迈格码（苏州）软件科技有限公司
苏州工业园区苏惠路98号15层1515室
电话：+86 512 62725820
邮箱：info@magmasoft.cn
官网：www.magmasoft.cn



MAGMASOFT®
autonomous engineering



Global Casting Magazine

世界铸造

STAFF / 工作人员

CHINA FOUNDRY ASSOCIATION 中国铸造协会

Publisher/President/ 出品人 / 会长

Libo Zhang/ 张立波

Senior Editor/ 主编

Thomas Gao/ 高巍, gaowei@foundry.com.cn

Quality Supervisor/ 质量总监

Yajuan Yuan/ 袁亚娟, yuanyajuan@foundry.com.cn

Editor & Advertising/ 编辑及广告

Maggie Li/ 李蒙蒙, limengmeng@foundry.com.cn

Sofia Nie/ 聂飞, niefei@foundry.com.cn

Graphic Designer/ 平面设计

Nina Tang/ 唐雅静, tangyajing@foundry.com.cn



张立波
出品人
中国铸造协会

FOUNDRY-PLANET.COM

Publisher/Editor

Thomas Fritsch, tf@foundry-planet.com

Content/Website Management

Maximilian Schrock, ms@foundry-planet.com

Advertising Sales

Oanh Larsen, ons@foundry-planet.com

Matthias Amann, ma@foundry-planet.com

Marketing

Florian Amann, amann@kanat-mediaverlag.de

Andreas Kanat, ak@foundry-planet.com



Thomas Fritsch
Publisher/Editor-in-Chief
Foundry-Planet.com

SUPPORTING ORGANIZATIONS 支持单位



Asia Foundry Association
亚洲铸造业联合会



BRICS Foundry Association
金砖国家铸造业联合会



FUNDIGEX
西班牙铸造出口商协会



Korea Foundry Society
韩国铸造学会



Pakistan Foundry Association
巴基斯坦铸造协会



APLINDO
印度尼西亚铸造协会



WORLD DIECASTING COUNCIL
墨西哥压铸协会

MEDIA PARTNERS 合作媒体





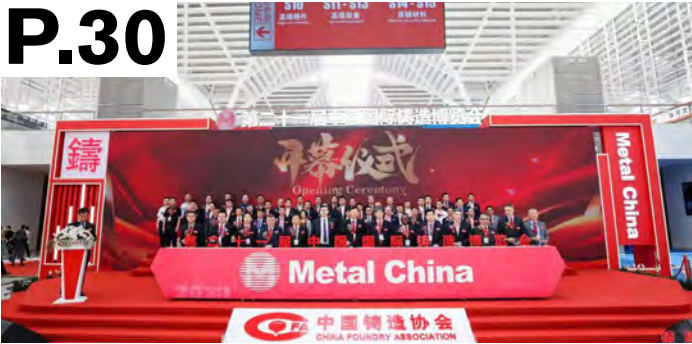
Global Casting Magazine

世界铸造

WWW.GLOBALCASTINGMAGAZINE.COM

JUNE 2023 VOLUME 13 NUMBER 2

P.30



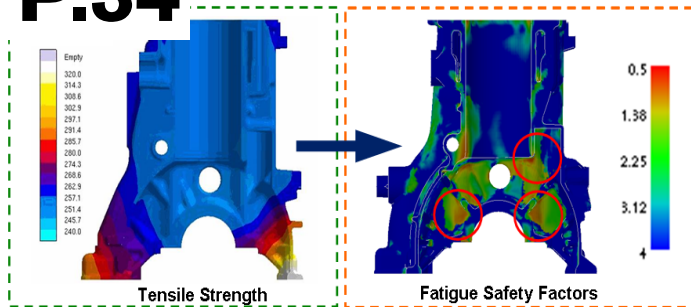
P.49



P.34

Simulation

CAE



FEATURES

- 30** METAL CHINA 2023—A New Chapter for High-quality Development
- 34** Implementation of Casting Simulation for Increased Engine Performance and Reduced Development Time and Costs—Selected Examples from FORD R&D Engine Projects

DEPARTMENTS

- 7** INDUSTRY NEWS
- 44** PRODUCT NEWS

专题文章

- 30** 铸博会首次在天津举办，开启高质量发展新篇章
- 34** 通过铸造模拟来实现发动机性能的提升以及开发时间和成本的降低——福特发动机 R&D 项目

专栏

- 7** 行业新闻
- 44** 产品新闻

Industry News Contents

行业新闻目录



ASIA

Ziheng & BMD Lead China Foundry Equipment Go Global 07
致恒 & BMD 带领中国铸造装备走向国际

Xi'an Electric Furnace Institute: industry leader for systematic solutions 08
西安电炉所肩负行业“领跑者”使命，提供系统化解决方案

Hongkang Melting Technology: High-efficiency and Energy-saving 09
高效节能，科技为先：宏康电气助力铸造熔炼高效节能

Looking Forward to Seeing You at Stand C02 In Hall 16 at GIFA 2023 In June 11
微晶期待在六月 GIFA 展 16 号展馆 C02 展台见到您

FHZL Supports Foundry Upgrading with Binder Jetting Robot Arm and Intelligent Production Line 13
峰华卓立推出机械臂砂型 3D 打印机和智能化产线，助力铸造产业升级



EUROPE

Calderys' Expertise Brings Safe, Sustainable And High-Quality Innovation To The Foundry And Refractory Sectors 14
凯得力公司秉持专业为铸造和耐火材料行业带来安全、可持续和高质量创新

Hungarian Die Caster Cuts Energy Consumption By 26% with OEM Furnace Relining From Strikwestofen 19
匈牙利压铸机通过史杰克西的 OEM 换炉将能耗降低 26%

Corporate Collaboration With Zeiss and A3DS for Customized Digitization in Industrial SMES 20
蔡司与 A3DS 合作为中小企业工厂提供定制数字化服务

Fully Optimised for Sustainability 22
全面优化可持续发展



NORTH AMERICA

Pace Industries Plans \$2.8 Million Expansion For Tennessee Plant 25
Pace Industries 计划斥资 280 万美元扩建田纳西工厂

Expanded Production, Capabilities At Godfrey & Wing 25
Godfrey & Wing 公司扩大产能

Thermotec Acquires Pc Campana Mini Riser Division 27
Thermotec 公司收购 Pc Campana 公司微型冒口业务

Gm Secures Lithium Source With \$650 Million Investment, Supply Agreement 27
通用汽车公司签订 6.5 亿美元的锂投资和供应协议

Ziheng & BMD Lead China Foundry Equipment Go Global

致恒 & BMD 带领中国铸造装备走向国际

Ziheng (Tianjin) Industry Co., Ltd is specialized in selling and producing international-level AMF series, HMT series vertical molding, parallel parting, match plate, flaskless automatic molding lines. It's among the best in domestic and international markets. Relying on scientific and technological progress, and it has developed a variety of products: such as HAP series of automatic pouring machine, HVM series shell decompression production line and other sets of equipment with mechanical, electrical and hydraulic complex factors. It has been awarded a number of national patents.

ZihengHengteer made a major strategic decision in 2013, which is the acquisition of world-renowned foundry industry, Germany's well-known brand BMD, and has sole proprietorship and holding "BMD Foundry Technology Co., Ltd." and "BMDZ Foundry Machinery Co., Ltd."

BMD began in 1855, and for 170 years, BMD has been closely associated with the sturdy and stable mechanical equipment in foundry industry worldwide, providing foundries with the most advanced and energy-efficient molding and sand preparation.

The equipment FPSZ60 will be displayed at the upcoming GIFA in Dusseldorf. The equipment has the following characteristics:

- Value up
- Low maintenance cost
- Suspended sand addition can improve the filling performance of sand blasting
- High efficiency, up to 12 seconds per cycle, single molding machine can reach 150 complete molds/hour (according to specifications)

BMD Booth No. at GIFA: Hall 15/D14

Tel.: +49(0)7045/20428-0

<http://www.bmdfoundry.com/>

<http://www.zihengtj.cn/> ■

致恒(天津)实业有限公司专业销售及生产具有国际先进水平的AMF、HMT系列垂直造型、水平分型、双面模板、脱箱自动造型生产线,国内市场占有率在国内外同行中名列前茅。公司相继研发出HAP系列

自动浇注机、HAG系列数控磨铣机、HCM系列制芯中心及HVM系列减压生产线等高复杂系数的光、机、电、液一体化的成套装备,拥有专利百余项。

公司于2013年在德国合资组建BMD铸造技术有限公司,2016年又在德国增加投入,成立BMDZ铸造机械有限公司。

BMD始于1855年,170年来,

BMD这一名称在全球范围内始终与铸造工业中坚固稳定的机械设备密切联系在一起,可以为铸造厂提供最先进、最节能的造型系统和砂处理系统。

公司将在2023年德国GIFA展期间展出设备FPSZ60,特点如下:

- 性价比高
- 维修成本低
- 悬浮加砂,可改善射砂充填性能
- 高效率,最高可达每循环12秒,单主机150整型/小时(据规格)

BMD公司在德国GIFA的展位号: Hall 15/D14. ■

联系电话: +49(0)7045/20428-0

<http://www.bmdfoundry.com/>

<http://www.zihengtj.cn/>



BMD 总裁任玉宝先生及设计、研发、服务人员

Mr. Yubao Ren, President of BMD, and our design, research and development, and service teams at BMD.

Xi'an Electric Furnace Institute: industry leader for systematic solutions

西安电炉所肩负行业“领跑者”使命，提供系统化解决方案

Xi'an Electric Furnace Institute was established in 1963 and is the only professional research institute in China engaged in the research and development of industrial electric heating technology. It has undertaken the construction of 12 key laboratories and engineering technology centers at the provincial or ministerial level; it is responsible for the duties of the National Electric Furnace Quality Inspection and Testing Center, and has undertaken the secretariat work of the Melting Branch of China Foundry Association.

The Institute has completed 2258 scientific research projects and won 156 scientific and technological awards of national and provincial level. It is the leading force in industry innovation and upgrading. The "Development and Application of Green and Efficient Electric Arc Furnace Steelmaking Technology and Equipment" of the Institute won the second prize of the 2019 National Science and Technology Progress Award. Entering the new era, the Institute shoulders the mission and responsibility of being industry leader. Focusing on the supply side structural reform of the industry and the new trends in global

西安电炉研究所成立于1963年，是中国唯一从事工业电加热设备技术研发的专业研究所，承建了“工业节能与绿色发展评价中心”、“陕西省四主体一联合电炉工程技术中心”等12个省部以上重点实验室和工程技术中心；负责国家电炉质量检验检测中心工作，承担了中国铸造协会熔炼分会等协会学会秘书处工作。

电炉所先后完成科研项目2258项，获国家和省部级科技进步奖156项，是行业技术创新、设备升级换代的主导力量，电炉所“绿色高效电弧炉炼钢技术与装备的开发应用”荣获2019年国家科学技术进步奖二等奖。进入新时代，电炉所肩负行业“领跑者”的使命和责任，围绕行业供给侧结构性改革和全球制造业发展新趋势，以智能化、数字化为抓手，发挥以研发设计及节能诊断为引领的系统化解决方案优势，聚焦结构调整、产业升级、智能制造、



土耳其 220t 电弧炉热试 Hot test of 220t electric arc furnace in Turkey



方坯感应加热 Induction heating of square billets



日照工厂 300t 精炼炉 300t refining furnace in Rizhao

manufacturing development, with intelligence and digitization as the handler, the Institute will leverage the advantages of systematic solutions led by research and development design and energy-saving diagnosis. They focus on structural adjustment, industrial upgrading, intelligent manufacturing, green manufacturing, and promote new processes and materials, promote the development and application of new manufacturing methods to facilitate the transform and upgrading of the industry.

Facing the future, the Institute adheres to the core values of "creating value through labor, especially intellectual labor", and is strategically positioned as "the industry's first engineering technology service provider and the customer's preferred full life cycle engineering technology service company", it will continuously improve its competitiveness and strive to create greater economic and social value.

For more information, please visit: <http://www.mccefi.com.cn/> . ■

绿色制造, 推进新工艺、新流程、新材料、新制造方法的发展和运用, 引领行业转型升级。

面向未来, 电炉所坚持践行“以劳动尤其是智力劳动创造价值”的核心价值观, 正按照“行业首先的工程技术服务商, 客户首选的全生命周期工程技术服务公司”的战略定位, 不断提高自身的竞争力, 努力为经济社会发展创造更大价值。

更多信息, 请访问公司网站 <http://www.mccefi.com.cn/> 。 ■

Hongkang Melting Technology: High-efficiency and Energy-saving

高效节能, 科技为先 宏康电气助力铸造熔炼高效节能

Taizhou Hongkang Electric Co., Ltd. has 18 years of experience in medium frequency induction heating industry. It is a modern technology enterprise specializing in the production and manufacturing, core technology research and development of equipment for power frequency, medium frequency, and high frequency heating, melting, insulation, quenching, heat treatment in the field of electromagnetic induction heating.

The company focuses on launching flagship products

泰州市宏康电气有限公司有 18 年中频感应加热生产经验, 是专业从事电磁感应加热领域内的工频、中频、高频的透热、熔炼、保温、淬火、热处理等设备的生产制造、基础研究及核心技术开发的现代科技企业。

公司重点推出节电节能中频熔炼炉、串联一拖二中频电炉、中频感应加热炉等拳头产品, 其中新型串联智能中频感应炉通过国家电炉质量监督检测中心的



并联高功率大吨位熔炼炉

Parallel-connection high power and large tonnage melting furnace



串联节能中频感应炉熔炼炉

Series-connection and energy-saving medium frequency induction melting furnace

such as energy-saving medium frequency melting furnaces, series connection medium frequency electric furnaces, and medium frequency induction heating furnaces. Among them, the new series connection intelligent medium frequency induction furnace has passed on-site inspection by the National Electric Furnace Quality Supervision and Testing Center, and all indicators are significantly better than national standards. The "unit power consumption" indicator is 20% lower than that of the national first-class product level. The company has passed the ISO9001 quality certification system, EU CE certificate, and SGS on-site certification. The company's product overall quality is at a leading level both home and abroad, and its products are sold worldwide. At present, the company has signed agency contracts with customers from multiple countries, and the overseas market will be further expanded.

With the widespread recognition of "Made in China" in the international market, Hongkang Company will continue with the research and development of new products, improve its service system, and provide better products and services to domestic and overseas customers.

The melting furnace is lightweight, with fast heating speed and high efficiency, saving 60% electricity on the same load compared to electronic tube high-frequency machines; It has multiple protection functions such as avoiding overcurrent, overvoltage, overheating, etc. It is easy to operate and install, suitable for various applications that require metal heating.

For more information, please visit: www.tz-hkdq.com. ■

现场检验，各项指标均大幅优于国家标准，其中“单位电耗”这项指标领先国家一等品电耗 20%。公司通过 ISO9001 质量认证体系、欧盟 CE 证书，SGS 实地认证，产品综合性在国内外处于领先水平，产品销往世界各地。目前，公司与多个国家的客户签订代理，海外市场在进一步拓展。

随着中国制造得到国际市场的广泛认可，宏康公司将持续地研发新产品、完善服务体系，为国内外客户提供更好的产品和服务。

熔炼炉设备轻巧，加热速度快，效率高；特别省电，同负载用电比电子管高频机节省 60%；具有过流、过压、过热等多种保护功能，操作简单，安装方便，适用于各种需对金属加热的场合。

更多信息，请访问 www.tz-hkdq.com ■

Looking Forward to Seeing You at Stand C02 In Hall 16 at GIFA 2023 In June

微晶期待在六月 GIFA 展 16 号展馆 C02 展台见到您

As the world's largest international trade fair for foundry technology, GIFA 2023 is an important event for the foundry industry. It provides a platform for foundry professionals from all over the world to come together to showcase their products, share their knowledge, and establish new business relationships. This year, Weijing, China's top degating machine maker and professional grinding solution provider, will be exhibiting at the event with one 100 square meters booth, although it is first time for Weijing to join in GIFA.

Weijing will be showcasing their unique degating machines and grinding machines at booth C02 in Hall 16. This is a fantastic opportunity for foundry professionals to see first-hand how Weijing's innovative solutions can help improve their foundry degating and fettling processes. Weijing has a reputation for producing high-quality, efficient, and reliable degating machines that are widely used in the foundry industry.

Degating is a critical process in foundry operations that involves removing feeders or ingates from raw casting parts. Weijing's degating machines are designed to provide matchable, flexible and high efficient degating. No matter you degate parts on the conveyor belt or on the floor directly, no matter you want wedge for casting iron or hammer for high manganese steel castings, you always can find the right degating machines at Weijing.

In addition to their degating machines, Weijing is also a professional grinding solution provider. They only offer down to earth grinding machines to help the foundries solve real fettling headaches with budget investment. Their grinding machines are highly efficient and durable. Their unique programming system combines CNC programming features and robotic programming convenience. No matter the operators have basic programming knowledge or not, it is quite easy for them to handle it quickly.

By exhibiting at GIFA 2023, Weijing is demonstrating their commitment to the foundry industry and their desire to provide innovative solutions to help improve foundry processes. Foundry professionals who visit their booth will have the opportunity to learn more about their products and services, as well as to discuss their specific needs and challenges.

Weijing's degating machines and grinding machines are designed to help foundries improve their efficiency, reduce unnecessary investment, and improve product quality. By investing in Weijing's solutions, foundry professionals can improve their processes and stay ahead of the competition.

If you're attending GIFA 2023, be sure to visit Weijing's booth in Hall 16, stall C02. Their team will be on hand to answer your questions, demonstrate their products, and discuss how their solutions can benefit your foundry operations. ■

作为世界上最大的国际铸造技术贸易展览会，GIFA 2023 是铸造业的一个重要事件。它为来自世界各地的铸造专业人士提供了一个平台，使他们能够聚集在一起展示他们的产品，分享他们的知识，并建立新的业务关系。今年，中国顶尖的铸件清理设备制造商和严谨的铸件打磨解决方案供应商，微晶公司将以 100 平方米的展位参展，这对微晶公司来说是第一次参加 GIFA。

微晶公司将在 16 号馆 C02 展位上展示他们独特的清理设备和打磨机。这是一个绝好的机会，让铸造业的专业人士看到微晶的创新解决方案如何帮助改善他们的铸件清理和打磨过程。微晶公司在生产高质量、高效率 and 可靠的清理方面享有盛誉，这些机器在铸造业中得到广泛使用。

铸件清理是铸造操作中的一个关键过程，它涉及到从原始铸造件上去除冒口或浇口。微晶公司的浇冒口分离器是为提供可匹配的、灵活的、高效的清理而设计的。


无论你是在传送带上还是直接在地面上对零件进行铸件清理，无论你是想用楔子处理铸铁还是用锤子处理高锰钢铸件，你都能在微晶找到合适的冒口清理设备。

除了清理设备之外，微晶也是一个严谨的打磨解决方案供应商。他们只提供脚踏实地的打磨机，帮助铸造厂以预算投资解决真正的打磨问题。他们的打磨机是高效和耐用的。他们独特的编程系统结合了数控编程功能和机器人编程的便利。无论操作人员是否有基本的编程知识，他们都能很容易地快速处理。

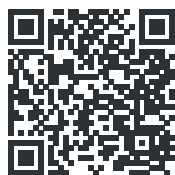
通过参展 GIFA 2023，微晶公司展示了他们对铸造业的承诺，以及他们提供创新解决方案以帮助改善铸造工艺的愿望。参观微晶公司展位的铸造业专业人士将有机会了解他们的产品和服务，并讨论他们的具体需求和挑战。

微晶公司的清理设备和打磨机旨在帮助铸造厂提高效率，减少不必要的投资，并提高产品质量。通过投资微晶的解决方案，铸造业的专业人士可以改善他们的工艺，在竞争中保持领先地位。

如果你参加 GIFA 2023，请务必参观微晶公司在 16 号馆 C02 展位的展位。他们的团队将在现场回答你的问题，展示他们的产品，并讨论他们的解决方案如何使你的铸造业务受益。■

A stylized illustration on a dark grey background. Five white line-art hands are arranged in a circle, each holding a segment of a thick green line. The green line forms a continuous loop around the text. A thin green vertical line extends from the top of the page down to the top of the green loop.

Creating the future
together



Visit us at GIFA
16-19 June 2023
Hall 12, Booth E01

FHZL Supports Foundry Upgrading with Robotic Arm 3DP and Intelligent Production Line

峰华卓立推出机械臂砂型 3D 打印机和智能化产线，助力铸造产业升级

FHZL Supports Foundry Upgrading with Binder Jetting Robot Arm and Intelligent Production Line

During the 21st China International Foundry Expo (METAL CHINA 2023) held from May 8-11 in Tianjin, the robot arm binder jetting sand 3D printer launched by FHZL, PCM-800R, has attracted widespread attention. With its compact printing platform and unlimited length extension, PCM-800R can meet the demands of flexible configuration of future digital factories.

The binder jetting 3D printing technology has been widely used in the foundry industry, and has been recognized as an important technology to reduce labor and cost, as well as to achieve eco-friendly manufacturing. As a leader of additive manufacturing technology in China, FHZL has integrated the latest technology into this binder jetting robot arm sand 3D printer with aims to solve certain difficulties for foundries in higher efficiency.

·The new generation sand printer increases the efficiency by over 40%;

·AI automatic error correction, timely printing error recovery and continuous print with least material waste;

·An independent negative pressure control system makes printing more stable and accurate, solving persistent difficulties of the industry;

·The full life cycle management system for consumables and vulnerable parts, timely maintenance reminds, improving the long-term operation;

·The robot arm printing system with a more compact structure, has flexible printing configurations achieving molding accuracy of no less than $\pm 0.3\text{mm}$, and can adapt to various build materials and binder types.

Compared to traditional printers with fixed job box, PCM-800R is working on a flexible job box with in-time auto feeding



在5月8日-11日举办的第二十一届中国国际铸造博览会，峰华卓立推出了一款机械臂式粘结剂喷射砂型 3D 打印机，这款被称为 PCM-800R 的新装备具有中小打印幅面、同时可无限拓展，适应于未来数字化工厂灵活配置的特点，在博览会期间引起了广泛关注。

粘结剂喷射砂型 3D 打印技术目前已被广泛用于铸造领域，被认为是降低传统铸造生产劳动强度和人力成

本以及实现绿色制造的重要技术。峰华卓立作为中国粘结剂喷射技术的龙头企业，本次推出的机械臂式粘结剂喷射砂型 3D 打印机同时集成了众多新技术，能够较好的解决当前该领域所面临的一些生产难题。

·新一代的高效新落粉铺粉砂型打印机，比上一代提高 40% 以上的效率；

·实现视觉 AI 自动纠错功能，及时修补打印错误，并持续打印，避免材料浪费；

·独立负压控制系统，让打印更稳定精确，解决行业长期痛点；

·耗材及易损件全生命周期管理系统，服务保养及时提醒，提高设备的长效运行；

·机械臂打印系统占地体积更小，打印灵活配置，精度不低于 $\pm 0.3\text{mm}$ ，适配多种材料和粘结剂。

PCM-800R 相比传统双缸打印机仅配置成形箱体，可在砂量不足时自动快速上料，减少开始阶段对材料的使用需求；将数字化灵活的工业机器人与粘结剂喷射打印系统相结合，简化了装备的整体配置，多轴整合化繁为简，XYZ 三轴方向皆由机械臂操作，每次打印铺砂自动抬升 0.2-0.5mm；

to guarantee stable supply for printing; As a perfect integration of flexible robot control and binder jetting printing system, PCM-800R has a simple but agile structure. Motions on X/Y/Z axis are done by robot arm, increasing the build height to 0.3-0.5mm layer by layer. Its 8-printhead and single pass printing system achieves super build speed. The simplified structure brings great convenience for maintenance, configuration extension and future upgrade.

Although the current structure supports a max build size of 800x500x300mm only, but length extension can be achieved through the coordination of robot arm and the job box.

In addition, in order to meet the increasing demand of binder jetting sand 3D printers in the foundry industry, FHZL has also provided a high-automation production line solution for sand 3D printing, including new/used sand storage, mixing system, main machine, primary sand cleaning, secondary sand cleaning, dip-coating zone, tunnel drier, digital vertical warehouse, with full support of RGV and grab robot arm for transfer. The auto production line is ideal for digital foundry upgrade.

To face the challenge of increasing demands on higher efficiency of 3D sand printing, FHZL has launched its largest printer PCM2500 with build speed of 25s per layer and max build volume of 2500x1500x1000mm, providing large-scale, fast and reliable production for the foundry industry. By reducing labor and adopting fewer nozzle solutions, it helps customers accelerate investment returns by reducing operating costs.

The robot arm binder jet 3D sand printer has expanded FHZL's product portfolio and enhanced its competitiveness. The launch of high-automation production line has brought new opportunities for further transformation and upgrading of foundries.

For more information, please visit www.fhzl.co or contact Mr. ZHANG Wei, Email: zw@fhzl.co ■

8 喷头阵列, 1 pass 打印, 实现快速成形; 简化的机构还为维修、扩展以及喷墨机构后期升级带来便利。

虽然当前推出的版本打印尺寸为 800x500x300mm, 通过机械臂与打印箱体的配合可完成任意的长度扩展打印。

除此之外, 面对粘结剂喷射砂型 3D 打印机对铸造行业的强劲需求, 该公司还推出了砂型 3D 打印智能柔性产线解决方案, 包含新砂库、旧砂库、供料辅机、打印主机、一级清砂位、二级清砂房、浸涂位、烘炉、智能立体仓储等, 全程采用 RGV 小车、机械梁搬运, 自动化粉末清理, 加快工厂的智能化运行。

面对铸造行业当前对砂型 3D 打印生产效率的追求, 该公司最大的 PCM2500 装备已经将打印时间控制在 25S 左右, 并计划生产 2500x1500x1000mm 的定制化设备, 为铸造行业提供大型和快速可靠的生产, 在减少人工的同时采用更少的喷头解决方案实现较低的运营成本, 帮助客户加快投资回报。

机械臂式粘结剂喷射砂型 3D 打印机的推出, 扩充了峰华卓立的产品线, 增强了砂型打印装备在百万级别内的市场竞争力; 智能化生产线的推出, 则为铸造工厂进一步的转型升级带来了新的契机。

更多信息, 请访问: www.fhzl.co, 联系人: 张唯, Email: zw@fhzl.co ■

Calderys' Expertise Brings Safe, Sustainable And High-Quality Innovation To The Foundry And Refractory Sectors

凯得力公司秉持专业为铸造和耐火材料行业带来安全、可持续和高质量的创新

High temperatures imply high energy. In a world striving to reduce carbon emissions, high temperatures also create a challenge – one that Calderys is prepared to solve.

Calderys is a leading provider of high-quality, efficient and sustainable solutions for high temperature industrial applications. It specializes in thermal protection for industrial equipment, with a range of refractory products, as well as solutions that enhance steel

高温意味着高载能。在全球都努力减少碳排放的时刻, 高温既是挑战——凯得力公司准备解决的挑战。

凯得力公司是一家为高温作业提供高质量、高效和可持续发展的解决方案的优秀供应商。专业从事工业设备高温下的保护, 拥有一系列耐火产品, 以及增强铸钢件冶金流动性和成

casting, metallurgical fluxes and molding processes. For the foundry industry, it is a one-stop-shop for all aspects of metal processing: from melting through to treatment and transfer, for both ferrous and non-ferrous applications.

Calderys is the fruit of over 100 years of field experience and innovation in high temperature operations. Leveraging the combined knowledge of its global network of experts, Calderys has always tailored its solutions to the needs of its customers. The company is now a privately owned standalone organization which is joining force with HarbisonWalker International, the largest supplier of refractory products and services in the United States to create a leading world-class refractories solutions provider with increased reach and scale.

Calderys' footprint in China: decades of services to the high temperature industries

Calderys' history in bentonite solutions for the molding shop dates back to 1998 when one of its precursor companies, S&B, expanded into the country. S&B would go on to be acquired by Imerys in 2015, becoming Imerys Metalcasting Solutions, now integrated to Calderys.

For the melting solutions, the presence in China began in 2002 in Shanghai. In 2005, the Imerys group acquired part of the activities of Plibrico International and Lafarge Refractories. Under the merger of these two activities, Calderys was born.

Today, Calderys offers refractories solutions for the melting shop thanks to its production site in Zhangjiagang (Jiangsu Province) which opened in 2006. The plant was ISO 9001 (quality management) certified in 2012 and ISO 14001 (environmental management) certified in 2013. It now employs more than 90 people, and produces annually more than 30,000 tons of refractory products for about 500 customers.

Concerning the molding shop, the company's advanced products and services enhance the metal casting processes of its foundry customers thanks to its production site in Jianping (Liaoning Province).

Refractory solutions for the melting shop

Calderys' expertise in the refractory sector goes all the way back to 1908. The technology has advanced significantly since then, but Calderys remains at the forefront of refractory technology for the foundry's melting shop, supplying a full range of refractory solutions, customizable to the unique requirements of the foundries.

Calderys China Vice President, Fiona Yang, leads Calderys China's business operation, from new business development to customer satisfaction.

F. Yang reflects on how Calderys is adapting in an ever-changing world. "It is thanks to our commitment to continuous innovation and our willingness to embrace new technologies that Calderys is able to keep growing and responding to our customers' evolving needs, especially linked to climate change," she says. "With rapid technological change and global net-zero carbon emission targets, we are powering new solutions to create value for customers while respecting our environment."

型工艺的解决方案。对于铸造行业来说，包括黑色和有色金属的应用，它是金属熔炼各环节一站式的供应商；从熔化到处理和转运。

凯得力公司有 100 多年高温作业经验和创新的成果。利用其全球专家网络的综合知识，凯得力公司一直根据客户的需求定制解决方案。公司现在是私营的独立公司，正在与美国最大的耐火产品和服务供应商哈宾逊沃尔克国际公司合作，扩大范围和规模，成为领先的世界级耐火材料解决方案供应商。

凯得力公司在中国的发展：几十年来不间断服务于高温行业

凯得力公司膨润土业务解决方案方面的历史可以追溯到 1998 年，当年随其前身公司艾斯比永同昌公司扩展到中国。艾斯比永同昌公司在 2015 年被益瑞石集团收购，成为益瑞石集团金属铸造板块供应商，现在又回归到凯得力公司。

作为熔炼工艺解决方案，2002 年在上海开始业务。2005 年，益瑞石集团收购了派力固国际公司和拉法基耐火材料公司的部分业务。在这两家公司的合并下，凯得力公司诞生了。

目前，凯得力公司 2006 年开业的位于张家港（江苏省）的工厂，为熔炼作业提供耐火材料解决方案，2012 年通过 ISO 9001（质量管理）认证，2013 年通过 ISO 14001（环境管理）认证，现有员工 90 余人，年生产耐火产品 3 万余吨，服务 500 多家客户。

在服务造型工部方面，公司在建平县（辽宁省）生产基地提供先进的产品和服务，提高了其铸造客户的金属铸造工艺。

熔炼车间耐火材料解决方案

凯得力公司在耐火材料行业的专业生产一直可以追溯到 1908 年。那时，耐火材料工艺取得了显著的进步，目前，凯得力公司仍然处于铸造厂熔炼工部耐火技术的前沿，提供全方位的耐火材料解决方案，可定制服务铸造厂的特殊要求。

凯得力（中国）公司副总裁杨凤女士全面负责凯得力公司在中国的业务运营，不断发展新业务达成客户满意。

杨总回顾了凯得力公司是如何在不断变化的市场中适应的。“由于我们致力于持续创新，以及我们接受新技术的意愿，客户能够保持增长，并应对客户不断变化的需求，特别是与气候变化相关的需求。”她说，“随着快速的技术迭代和全球净零碳排放目标，我们正在推动新的解决方案，在尊重环境的同时为客户创造价值。”

凯得力公司创新的硅混合耐火材料是一个很好的例子，它适合铸造厂的工艺。

Silica Mix refractories is a good example of a solution developed by Caldersys that is tailored to the foundries' processes.

SILICA MIX refractories: tailored to the coreless induction furnace

Ensuring the availability, reliability and safety of coreless induction furnace (CIF) operations is essential within the casting process. Central to this is the approximate 100mm-thick working refractory lining. This separates the water-cooled coil from the molten metal, which reaches temperatures of up to 1,600°C. Failure of this lining is not an option: it would result in catastrophic damage to the CIF, putting workers at risk and leading to an extended stop in production.

Calderys produces its silica-based refractory solutions, SILICA MIX thanks to a unique position. Firstly, from high-quality quartzite that can be found at Caldersys' quarry in Sweden's Dalsland region and, secondly, thanks to the production capacity of the production site in Åmål, just a few minutes away from the quarry. This exceptional material is the highest-grade raw material for silica-based refractories in the world and offers a range of unique properties:

- Excellent refractoriness (about 1,700°C) and resistance to thermal shock, reducing the risk of cracking to the lining.
- Ultra-low surface porosity when sintered, reducing the risk of steam ingress through the lining and damage to the coil.
- Strong resistance to chemical attack.
- Relatively low density, resulting in low heat loss.
- High (acidic) pH, making it compatible with most iron slags

These qualities offer enhanced protection of CIF components and increase the operating life of SILICA MIX refractories when compared to other furnace lining solutions. Time between maintenance stops is therefore extended with SILICA MIX – helping to maximize furnace uptime.

Calderys also developed a boron-free SILICA MIX product that matches the performance characteristics of standard SILICA MIX products. In trials, these products showed no signs of cracking or ingress of molten iron, even after a high number of heats and in one-shift operations, where continuous cycles of heating and cooling place significant stress on the lining.

High-quality bentonite at the heart of Caldersys' solutions for the molding shop

Calderys' offer includes a wide range of solutions for the molding shop based around high-quality bentonite reserves. Bentonite is supplied to the Chinese market from Caldersys'.

Jianping quarry and factory site in Liaoning, which expanded in 2020 to double the capacity of the dryer and install new milling capacity. The high grade of raw material is characterized by high thermal durability, high green compression strength and high wet tensile strength. Annual production stands at 250,000 tons, supplying about 300 customers in China.

The Jianping quarry contains 2 million tons of high-quality bentonite raw ore reserves, which can ensure a continuous supply of high-quality products to foundry customers. The management of

硅混合耐火材料：适用于无芯感应炉

确保无芯感应炉 (CIF) 作业的可用性、可靠性和安全性在铸件生产过程中至关重要。这其中的核心是大约 100mm 厚的耐火炉衬的工作层。耐火炉衬将水冷线圈与温度高达 1600°C 的熔融金属分离。这种炉衬的失效是不可接受的：将给企业造成灾难性的破坏，使工人处于危险之中，并导致长时间停产。

凯得力公司提供的硅基耐火材料解决方案，得益于二氧化硅混合物的独特位置。首先，在瑞典达尔斯拉地区的凯得力公司采石场可以找到高质量的石英岩，其次，由于阿迈勒生产基地的生产能力，距离采石场只有几分钟的路程。这种特殊的材料是世界上最高等级的硅基耐火材料的原料，并具有一系列独特的性能：

- 优异的耐火性 (约 1700°C) 和抗热冲击，降低了炉衬开裂的风险。
- 烧结时表面超低孔隙率，减少了蒸汽通过炉衬进入和损坏线圈的风险。
- 强的耐化学腐蚀。
- 相对较低的密度，热损失较低。
- 高 (酸性) pH 值，使其与大多数铁渣兼容。

与其他炉衬材料相比，这些特性提供了更强的保护，提高了二氧化硅混合耐火材料的使用寿命。因此，二氧化硅混合材料使停炉维护间隔的时间延长 – 有助于最大限度地提高熔化炉的正常作业时间。

凯得力公司还开发了无硼二氧化硅混合产品，符合标准二氧化硅混合产品的性能特性。在试验中，即使在多次的加热和转运操作中，这些产品没有显示出开裂或熔融铁液侵入的迹象，连续的加热和冷却循环对炉衬造成显著的应力。

高质量的膨润土是凯得力公司为造型车间提供解决方案的核心

基于高质量的膨润土储备，凯得力公司为造型工部提供广泛的解决方案。膨润土从凯得力公司位于辽宁省建平县的采矿场和工厂供应中国市场，2020 年扩大的烘干机产能增加一倍，并安装了新的铣磨设备。高等级的原料具有热耐久性高、湿抗压强度高、湿抗拉强度高特点。年产量为 25 万吨，供应中国约 300 名客户。

建平县采矿场拥有 200 万吨优质膨润土原矿储量，可确保向铸造客户持续供应高品质产品。由于公司的矿山恢复和管理项目，该采石场的管理被认为是行业的标杆。

经过与铸造行业近 10 年的携手工作，凯得力公司已成

this quarry is considered a benchmark in the industry, thanks to the company's mine restoration and management programs.

After nearly 10 years of working hand in hand with the foundries, Calderys has become one of the major foundry bentonite suppliers in Asia. The company's molding shop solutions offer foundries the opportunity to improve casting quality and reduce scrap and rework rates – with knock-on benefits for energy and resource efficiency, as well as cost reduction. The products can be tailored to meet customer requirements, with activation precisely controlled to ensure stability. For green engineering blends, Calderys experts formulate specific bentonite-based solutions based on site visits and thorough analysis.

Calderys is a true one-stop-shop for foundries, offering high technical expertise from the melting shop all the way down to the molding shop. Leveraging a global network of expertise with local points of contact, Calderys works hand in hand with the foundry shop and has - over the decades - become a true partner to the foundry men and women.

Calderys Zhangjiagang takes the lead in environmental protection and workers' health

Calderys opened its Zhangjiagang Plant in Jiangsu Province in 2006 to produce refractory products for the Chinese market. In 2021, the plant achieved a first for the refractory industry, when it was recognized by the provincial government for leadership in environment protection.

That journey had begun five years earlier, when the plant improved the quality of its raw materials. The new materials contain significantly less water, allowing the Zhangjiagang.

Plant to reduce the use of its natural gas-fired drying kiln – a step that substantially reduced energy consumption and related carbon emissions. In total, natural gas use fell by 23,000m³ per year.

In addition, the plant improved its dust control measures, using dust-proof partitioning to protect workers from exposure to airborne particles, and dust extraction systems to collect dust for disposal. Airborne dust concentrations now average 4.3mg/m³ compared to the national regulatory standard or 120mg/m³.

In March 2023, Calderys China was listed as an Environmental Protection Demonstration Enterprise by the Suzhou Ecological Environment Bureau, thanks to the teams' efforts in dust control, management of dangerous chemicals, and overall environmental compliance. The Bureau's list of enterprises includes 156 companies. The accreditation aims to encourage companies and institutions to play a positive leading role in ecological and environmental protection.

Visit Calderys at GIFA 2023

Calderys will present its products and services at GIFA – the leading international Trade Fair for the foundry industry – will take place on the 12th to 16th of June in Düsseldorf (Germany), with Calderys in Hall 10, stand C72. ■

为亚洲主要的铸造用膨润土供应商之一。公司为造型工部提供的解决方案，提高了铸件质量和减少废料和返工——以提高能源和资源效率，以及降低成本。产品可根据客户的要求进行定制，精确控制激活，以确保稳定。对于粘土湿型砂工艺，凯得力公司的专家们根据实地考察和彻底分析制定具体的基于膨润土的解决方案。

凯得力公司是铸造行业真正的一站式解决方案供应商，提供高技术的专业知识，从熔炼一直到造型。利用本地联络点和全球专业网络，凯得力公司与铸造行业携手合作，并在几十年里成为铸造人真正的合作伙伴。

凯得力公司张家港工厂在环保和员工健康方面处于领先

凯得力公司于 2006 年在江苏设立张家港工厂，为中国市场生产耐火材料产品。2021 年，工厂首次进入耐火材料行业，获得了省政府环保领导能力的认可。这段旅程始于五年前，当时工厂提高了原材料的质量。新材料的含水量明显减少，使张家港工厂减少天然气干燥窑的使用，这一步骤大大降低了能耗和相关的碳排放。天然气使用量每年累计减少 2.3 万立方米。

此外，工厂还改进了其防尘措施，使用防尘隔板来保护工人不暴露于空气中的粉尘，以及使用除尘系统来收集灰尘并处理。空气中的粉尘浓度现在平均为 4.3 mg/m³，而国家标准中的粉尘浓度为 120 mg/m³。

2023 年 3 月，由于团队在防尘、危险化学品管理、全面环保等方面的努力，凯得力（中国）公司被苏州市生态环境局列为环保示范企业。该局的企业名单包括 156 家公司。该认证旨在鼓励企业和机构在生态和环境保护方面发挥积极的领导作用。

欢迎光临凯得力公司在德国国际铸造展览会展位

凯得力公司将于 6 月 12–16 日在杜塞尔多夫（德国）举行的德国国际铸造展 GIFA 上展示其产品和服务，凯得力公司展位：10 号馆 C72 展位。■



WELCOME TO CALDERYS

We are a leading global provider for industries operating in high temperature conditions. Pushing the boundaries of innovation and excellence, we deliver high-quality materials and services adapted to the foundries' melting & molding shops.

www.calderys.com

 calderys

Hungarian Die Caster Cuts Energy Consumption By 26% with OEM Furnace Relining From Strikowestofen

匈牙利压铸机通过史杰克西的 OEM 换炉 将能耗降低 26%

Based in Hungary, FÉMALK Zrt. has been supplying the global automotive industry with high quality aluminium castings for almost 30 years.

Melting up to 4000 tons of aluminium per month to produce parts ranging from engine and gearbox supports, suspension components and electronic covers, to headlight and thermostat housings, FÉMALK needs its melting and dosing furnaces to operate with high levels of energy efficiency. Even after years of service.

To see where potential savings and sustainability gains could be achieved through equipment modernization options, the Hungarian die caster approached long-term supplier StrikoWestofen, via local agent PRACTILUB Professional Zrt., to review equipment and identify opportunities.

Melting furnace: exceeding energy reduction expectations

FÉMALK asked StrikoWestofen to start by looking at a 12-year-old StrikoMelter shaft melting furnace in need of relining.

StrikoMelter is energy efficient design, as hot waste gases from the melting process are used to preheat the melting material in the EtaMax shaft prior to the actual melting process. Ideal for helping die casters achieve their sustainable casting goals.

But as with any melting furnace, mechanical and thermal stress caused by temperature deviations, charging materials and dross, make refractory relining an inevitable and necessary process for maximizing furnace lifespan, optimizing melting performance and avoiding damage-related energy loss.

Based on performance tests carried out in partnership with FÉMALK prior to relining, StrikoWestofen identified that energy savings of 22% could be achieved with a full relining of the furnace melting chamber and partly cosmetic repair of the holding chamber. Not enough, further energy saving options had been carried out such as the optimization of the melting process.

The StrikoMelter was removed, relined, re-installed and tested under full operational conditions in less than 4 weeks, with results showing that the energy consumption per ton of molten aluminum had been reduced by 26%, significantly above the target set.

Bence Gölöncsér from FÉMALK commented:

近 30 年来，总部位于匈牙利的 FÉMALK Zrt 公司为全球汽车行业提供了高质量的铝合金铸件。

FÉMALK 公司每月可熔炼 4000 吨的铝合金，产品包括从发动机、变速箱支架、悬架部件和电子端盖到前照灯和恒温器外壳等各种部件，并且要求其熔炼炉和定量炉即使在服务多年之后仍能高效运行。

为了了解通过设备的现代化升级可以在哪些方面实现节约以及存在的可持续性收益，匈牙利压铸企业通过当地代理商 PRACTILUB Professional Zrt. 与史杰克西公司取得了联系，了解设备并确立合作。

熔炉：超出节能预期

FÉMALK 公司要求史杰克西公司从一个已使用 12 年且需要换衬的 StrikoMelter 竖炉着手进行改造。

StrikoMelter 是一种节能设计，因为在熔炼正式开始之前，熔化过程中产生的热废气用于预热 EtaMax 轴中的炉料，是帮助压铸机实现可持续生产目标的理想选择。

但是，与任何熔炼炉一样，由于温度偏差、炉料和浮渣引起的机械和热应力，耐火材料炉衬成为可以最大限度延长熔炉寿命、优化熔炼性能、避免与损坏相关的能量损失的必然且必要的工艺步骤。

根据与 FÉMALK 公司在换衬之前合作中所做的性能测试，史杰克西公司认为，通过对熔炉的熔融室进行完全换衬以及对保温室进行部分外观修复，可以节约 22% 的能耗。不仅如此，还做了进一步的节能方案，如优化熔炼工艺。

StrikoMelter 在不到 4 周的时间内被拆除、换衬、重新安装并在完全运行条件下进行了测试，结果显示每吨熔融铝的能耗降低了 26%，大大高于设定的目标。

FÉMALK 公司 Bence Gölöncsér 评论道：“史杰克西公司从开始到最后都非常透明，我们双方通过合作，获得了更换衬里前后的真实绩效数据，从而设定和衡量目标。”

“StrikoWestofen were very transparent from start to finish, working in partnership with us to obtain true performance figures - pre and post relining - to set and measure targets.

“We knew that the saving level estimated was based on a 50:50 ratio of ingots/returns. However, operating needs meant the post-refurb testing was carried out with ingots accounting for approximately 91% of charging material. Given that this should have resulted in a lower % improvement - as charging with larger quantities of ‘new’ aluminium ingots consumes more energy - to have achieved savings greater than the target specified was very impressive. We are delighted with the results and the speed with which this project took place.”

Dosing furnace: two Westomat relinings in two weeks

As part of its energy efficiency review of FÉMALK’s equipment, StrikoWestofen also refurbished two Westomat dosing furnaces. Relining dosing furnaces with OEM parts rather than third-party alternatives has been proven to reduce energy consumption by up to 50% - a fact FÉMALK sought to capitalize on.

StrikoWestofen has developed a dosing furnace relining service which uses high quality pre-casted refractory parts. As well as improving insulation and therefore energy consumption, this approach also means relining can be carried out far quicker. This is due to the pre-casted refractory parts being delivered in a pre-sintered state, therefore speeding up the heating process once work on the furnace is complete.

Holger Stephan from StrikoWestofen said: “We completed relining work on the Westomat in less than 2 weeks, ensuring minimal disruption for the customer. At a time when energy costs are so high, the savings generated, combined with the performance improvements delivered for the StrikoMelter, will enable FÉMALK to reduce operational costs and optimize ROI on their equipment. The project also supports the customer’s focus on sustainable production.” ■

“我们知道，预估的节能水平是基于铸锭 / 返炉的 50:50 比例而确立的。然而，运营需求意味着重新加炉料后的测试是用铸锭进行的，铸锭约占填充炉料的 91%，这样获得的改善应该会很低，因为用更多的新铝锭填充炉料会消耗更多的能量，获得的节能效果高于目标，这是令人印象深刻的。我们对这个项目的成果和实施速度感到高兴。”

定量炉：两周内完成两次 Westomat 换衬

作为对 FÉMALK 设备能效考察的一部分，史杰克西公司还翻新了两台 Westomat 定量炉。事实证明，用 OEM 零件而不是第三方替代品重新更换定量炉可以将能耗减少 50%，这是 FÉMALK 公司试图寻求的效果。

史杰克西公司开发了一种使用高质量预制耐火部件的定量炉换衬服务，该服务除了可以优化绝缘性和降低能耗外，还意味着可以更快地进行换衬。这是由于预制耐火部件是在预烧结状态下交付的，一旦炉子上的工作完成，就能够加快加热的过程。

来自史杰克西公司的霍尔格·斯蒂芬说：“我们在不到 2 周的时间内完成了 Westomat 的换衬工作，确保对客户干扰降至最低。当前企业的能源成本是很高的，该项目节约的成本，以及 StrikoMelter 的性能改进，将降低 FÉMALK 公司的运营成本并优化其设备的投资回报率。该项目还支持客户对于可持续生产的关注。” ■

Corporate Collaboration With Zeiss and A3DS for Customized Digitization in Industrial SMES

蔡司与 A3DS 合作为中小企业工厂提供定制数字化服务

Siempelkamp Foundry presents world's largest non-contact robot measuring cell

Together with its project partners, ZEISS Industrial Quality Solutions and the startup a3Ds, the Siempelkamp Foundry presented the world's largest non-contact robot measuring

Siempelkamp 铸造推出世界上最大的非接触式机器人测量单元

Siempelkamp 铸造公司，与两家项目合作伙伴：蔡司工业质量解决方案公司和初创公司 A3DS 一起，今天



cell to the public at large today. “With this unique and highly innovative technology we are further advancing our comprehensive digitalization strategy. We are now able to track the entire component geometry of our products, from model to casting mold, all the way to the finished casting, in a digitized manner,” explains Dr. Georg Geier, the foundry’s managing director. As a world first, the new robot measuring cell is the special pride of the world’s leading, Krefeld-based hand-casting manufacturer. It allows for the fully automated, non-contact and reliable inspection of finished components up to a weight of 240 tons. Even though the robot measuring cell is nearly as large as a tennis court, its measuring accuracy is less than 0.6 mm thanks to up to twelve million 3D measuring points. “This system is the most advanced and powerful of its kind and helps us further optimize our casting and production processes through digital technology,” Geier adds. The foundry’s customers also benefit from the new metrology: owing to the millimeter-accurate inspection of components which are several meters long and weigh several tons, the quality of the components increases in terms of sustainability and efficiency in processing and operation.

New digital metrology is also used at the beginning of the process chain

However, in the future not only the finished cast components of the Siempelkamp Foundry will be inspected for complying with the highest quality standards with millimeter precision based on digital technology. Already at the beginning of the process chain, the foundry employs 3D metrology from ZEISS Industrial Quality Solutions, which was also demonstrated today. With the ZEISS T-SCAN hawk, the foundry has considerably further expanded its possibilities

正式向公众展示了世界上最大的非接触式机器人测量单元。公司董事总经理 Georg Geier 博士解释道：“凭借这项独特且高度创新的技术，我们正在进一步全面推进我们的数字化战略。我们现在已能够以数字化的方式跟踪产品整个部件的几何形状，从模具到铸模，一直到最终铸件产品。”作为世界第一家推出新型机器人测量单元的企业，这家世界领先水平的 Krefeld-based 铸造制造商感到十分自豪。该产品可以对重达 240 吨的成品部件进行全自动、非接触式和极具可靠性的检查。尽管机器人测量单元几乎和网球场一样大，但由于其具有多达 1200 万个 3D 测量点，其测量精度可以达到低于 0.6 毫米。Geier 博士补充道：“该系统是同类系统中最先进和最强大的，可以帮助我们通过数字技术进一步优化铸造和生产流程。”铸造厂的客户也能从新的测量方式中受益：因为可以实现对部件规格进行毫米级的精确检测，精确确定需要几米长和几吨重的铸件，部件的质量在加工和操作的可持续性和生产效率方面得到了提高。

新的数字测量也被用于生产流程链的开端

然而，在未来数字化技术不仅会应用于对 Siempelkamp 铸造公司的成品铸件进行检查，以确保其符合基于数字技术的毫米精度的最高质量标准。在生产流程链的最初，该铸造公司就使用了蔡司工业质量解决方案的 3D 测量，这一点今天也进行了演示。凭借蔡

concerning optical laser metrology. The handy scanner can check the dimensions and geometries of wooden models that constitute a positive of the finished cast component with great precision and avoid errors at the very start of component production. “In this way, target and actual values can be mapped very transparently for our customers in the early stage of our production processes. This opens up previously unimagined potentials in terms of construction precision,” elaborates Dirk Howe, Managing Director of the Siempelkamp Foundry. Thanks to the software platform ZEISS Quality Suite, the entire component development can be seamlessly tracked throughout the entire process in the foundry. The foundry’s customers benefit from a wealth of information gained through the digital processes concerning the manufactured components, which can serve them in their further use.

Digitalization offensive succeeds thanks to strong technological partnerships

At today’s presentation of the latest successes of the digitalization strategy of the Siempelkamp Foundry, Dirk Howe expressed his great pride in the developments that have been achieved together with ZEISS Industrial Quality Solutions and a3Ds. The commissioning of the technologically groundbreaking robot measuring cell, he said, constitutes the latest success in the Siempelkamp Foundry’s complete concept in order to make its entire process chain more automated and digital. The Siempelkamp Foundry already set benchmarks last year by digitizing its crucible induction furnaces. By optimizing the metrology in the foundry, yet another pioneering achievement has now been implemented.

“In conjunction with our collaboration partners we have developed the world’s first high-tech robot measuring cell for such large and complex components on our own initiative. In this way we are strengthening Germany as a business location for the long haul and at the same time make a notable contribution to more digitalization and automation in Germany’s SMEs. We are pleased to now be offering customers throughout the world solutions of even better quality to improve their competitive edge”, Howe said. ■

司 T-SCAN hawk 产品，该铸造公司进一步极大扩展了其在光学激光测量方面的可能性。使用手持的扫描仪可以非常精确地检查木制模型的尺寸和几何形状，这些模型构成了成品铸件的正模，并避免了在部件生产一开始就出现错误。Siempelkamp 铸造公司董事总经理 Dirk Howe 阐述道：“通过这种方式，在生产过程的早期阶段，我们就可以非常直观和透明地为我们的客户投射出生产目标并展示实际价值。这在施工精度方面发掘出了以前无法想象的潜力。”得益于蔡司质量套件软件平台，整个组件开发可以在铸造厂的整个过程中得到严密跟踪。铸造厂的客户受益于通过数字化流程获得的与制造部件有关的丰富信息，这些信息可以为他们的下一步使用提供支持。

强大的技术合作伙伴关系使数字化攻势取得成功

在今天介绍 Siempelkamp 铸造公司数字化战略的最新成果时，Dirk Howe 对蔡司工业质量解决方案和 A3DS 共同取得的进步表示非常自豪。他说，技术突破性的机器人测量单元的调试是 Siempelkamp 完整概念的最新成就展示，目的是使其整个工艺链更加自动化和数字化。Siempelkamp 去年已经通过数字化坩埚感应炉设定了新的发展基础。现在又通过优化铸造流程的测量，实现了另一项开创性成就。

“与我们的合作伙伴一起，我们开发了世界上第一个用于此类大型复杂部件的高科技机器人测量单元。通过这种方式，我们正在加强德国作为长期商业场所的地位，同时致力于为德国中小企业的数字化和自动化做出显著贡献。我们非常期待为世界各地的客户提供更优质的解决方案，以提高他们的竞争优势”，Howe 这样总结说。■

Fully Optimised for Sustainability

全面优化可持续发展

BMW Group Plant light metal foundry recertified by Aluminium Stewardship Initiative (ASI) +++ Solar aluminium meets more than a third of light metal foundry’s annual requirements +++ Almost two thirds of aluminium used comes from recycling loop

The BMW Group's light metal foundry in Lnadshut

宝马集团兰茨胡特轻金属铸造厂再次更新了来自《铝业管理倡议》的认证：

——太阳能铝至少可以满足轻金属铸造厂年需求的三分之一

——目前使用的几乎三分之二的铝来自回收循环

has once again been certified by an independent party for its sustainable use of aluminium – meeting the standards of the Aluminium Stewardship Initiative (ASI), an international non-profit organisation supported by environmental and industrial associations, aluminium producers and processing companies. The ASI defines sustainability criteria for an environmentally and socially responsible aluminium value chain.

“Sustainable extraction of raw materials and conscious use of resources play a key role for our in-house component production and our global supplier network,” says Dr Joachim Post, member of the Board of Management of BMW AG responsible for Purchasing and Supplier Network. “Sourcing aluminium produced using solar power for our in-house component production lowers our CO2 emissions significantly. The circular economy is also key to reducing emissions and conserving natural resources. Going forward, the aim is to build our new vehicles with 50 percent secondary raw materials.”

Solar aluminium meets more than a third of annual requirements

Landshut’s light metal foundry, the BMW Group’s only production facility for light metal casting in Europe, is among the most advanced, most sustainable foundries in the world. Thanks to its use of inorganic

宝马集团位于兰茨胡特的轻金属铸造厂，在铝的可持续使用方面，再次达到了独立运营机构——铝业管理倡议（ASI）的要求和标准，获得了认证更新。铝业管理倡议（ASI）是由环境和工业协会、铝生产和加工企业支持的国际性非营利组织。该倡议制定出一系列对环境和社会负责的铝价值链的可持续性标准。

宝马股份公司采购和供应商网络管理委员会成员 Joachim Post 博士表示：“对原材料的可持续开采和对资源的有意识使用，对于我们的内部零部件生产和全球供应商网络起着关键作用。”通过使用太阳能完成生产过程获得的铝，用来进行我们内部零部件生产，这大大降低了我们的二氧化碳排放量。循环经济也是减少排放和保护自然资源的关键。在未来我们的目标是用 50% 的二次原材料来生产新车。”

太阳能铝可以满足至少三分之一的年度需求

兰茨胡特的轻金属铸造厂是宝马集团在欧洲唯一的轻金属铸件生产厂，是世界上最先进、最具可持续生产能力的铸造厂之一。由于它使用了无机砂芯，铸造过程几乎是零排放的。该轻金属铸造厂于 2021 年开始使用太阳能生产的铝。由于铝的生产过程是高度能源密集型的，



sand cores, the casting process is virtually emission-free. The light metal foundry began sourcing aluminium produced using solar power in 2021. Since producing aluminium is highly energy-intensive, the use of green power such as solar electricity offers considerable potential for reducing CO₂ emissions. The tens of thousands of tonnes of solar aluminium supplied in this way meet more than a third of annual requirements for the light metal foundry at Plant Landshut.

CO₂-optimised recycling loop with closed foundry loop

Along with steel, aluminium accounts for the largest share, by weight, of the materials used in BMW Group vehicles. Around two thirds of the aluminium used in Landshut comes from a recycling loop – with almost two thirds of this from the foundry's own closed loop. In this way, the BMW Group is consciously reducing its use of more CO₂-intensive primary aluminium in favour of a CO₂-optimised recycling loop. Green power is also used to produce it.

The BMW Group has a long tradition of responsible use of aluminium. For more than ten years, the light metal foundry has been working with local processors to implement a recycling loop for post-production scrap metal salvaged from the foundry process. The decisive factor here is clean separation of aluminium residues. Residues are collected from all casting and mechanical processing stations according to type, so materials with different compositions are not mixed. This means that, after reconditioning, aluminium waste can be reused to manufacture the same components.

“The BMW Group has supported the Aluminium Stewardship Initiative from the beginning,” says Dr Stefan Kasperowski, head of BMW Group Plant Landshut and the light metal foundry, which is the largest production area at the plant in Lower Bavaria. “We are fully aware of our responsibility and value sustainable production of raw materials for our manufacturing.”

Last year, employees at the light metal foundry produced around 3.3 million cast components with a total weight of more than 73,000 tonnes. The scope of production includes engine components such as cylinder heads and crankcases, components for electric drive trains and large-scale structural components for vehicle bodies.

The responsibility of the BMW Group extends beyond recycling to the aluminium used. The conditions under which the raw material bauxite is extracted by open cast mining and processed in countries like Australia, Brazil and Guinea are also important to the company.

The BMW Group is in direct contact with aluminium suppliers and recycling partners in an effort to gradually expand ASI certification to the entire material cycle – starting with the producing mines.

The light metal foundry has now been certified to the ASI Performance Standard for the second time.

使用太阳能等绿色能源在减少二氧化碳排放方面具有相当大的潜力。以这种方式供应的数万吨太阳能铝可以满足兰茨胡特轻金属铸造厂年度需求的三分之一及以上。

CO₂ 优化回收循环，达成闭环铸造过程

在宝马集团汽车生产所用的材料中，铝与钢一样，按重量计算占了最大份额。兰茨胡特工厂使用的铝约有三分之二来自回收循环，其中近三分之二来自铸造厂自己的闭环应用。通过这种方式，宝马集团有意识地减少对二氧化碳密集型原铝的使用，以支持二氧化碳优化回收循环。绿色能源也被用来生产这些铝材。

宝马集团在负责任地使用铝合金方面有着悠久的历史。十多年来，这家轻金属铸造厂一直在与当地加工商合作，对铸造过程中产生的废金属实施回收循环。这里的关键性要素是铝残留物的清洗分离。残留物是根据其类型从所有铸造和机械加工流程中收集而来的，因此不同成分的材料不会被混合在一起。这意味着在重新处理后，这些铝废料可以重新用于制造相同的部件。

“宝马集团一直以来都坚定支持《铝业管理倡议》，”宝马集团兰茨胡特工厂和轻金属铸造厂负责人 Stefan Kasperowski 博士说，该工厂位于下巴伐利亚州工厂最大的生产区。“我们充分意识到我们的责任，重视我们所从事的制造业的原材料可持续生产。”

去年，这家轻金属铸造厂的员工生产了约 330 万个铸件，总重量超过 7.3 万吨。生产范围包括气缸盖和曲轴箱等发动机部件、电动传动系部件和大型车身结构部件。

宝马集团的责任感不局限于回收使用过的铝料。在澳大利亚、巴西和几内亚等国家露天开采铝土矿的条件对该公司也很重要。

宝马集团正与铝供应商和回收合作伙伴直接沟通，努力将《铝业管理倡议》(ASI) 认证的应用逐步扩展到整个材料周期——从矿山生产开始。

该轻金属铸造厂现已第二次通过《铝业管理倡议》(ASI) 性能标准认证。审计标准要求提供材料管理的证据，如公司自身产品的整体生命周期分析和全面的回收策略，以及政策执行透明度、整体管理水平和公司诚信标准等。之前，基于材料管理标准的首次成功认证是于 2019 年 12 月完成的。

报道来源：www.press.bmwgroup.com ■

The auditing criteria require evidence of material stewardship, such as a holistic lifecycle analysis for the company's own products and a comprehensive recycling strategy, as well as compliance with standards for transparency, overall management and corporate integrity. The initial successful certification in accordance with the criterion of material stewardship took place in December 2019.

Source: www.press.bmwgroup.com . " ■

Pace Industries Plans \$2.8 Million Expansion For Tennessee Plant

Pace Industries 计划斥资 280 万美元扩建田纳西工厂

Pace Industries LLC is investing \$2.8 million to expand manufacturing operations at its facility in Jackson, Tennessee. The aluminum, zinc, and magnesium diecasting manufacturer will add 49 new jobs while meeting increased customer demand from a wide range of industries. "Pace Industries has always believed that the greatest asset a company has is its employees, and through this expansion, we hope to sustain permanent growth and the financial independence of our employees while raising the quality of life experienced in Jackson," said Pace Industries General Manager Jerry Peterson.

Tennessee Department of Economic Development Commissioner Stuart McWhorter said, "Pace Industries could have chosen to expand at any one of its locations, but it's a testament to our state's skilled workforce and business-friendly atmosphere that this company chose Tennessee. Jackson and Madison County have a robust manufacturing industry that will be the ideal climate to support Pace Industries' success. ■

Pace Industries 公司计划斥资 280 万美元，用于田纳西州杰克逊工厂的扩建。这家铝、锌和镁合金的压铸企业将增加 49 个工作岗位，满足日益增长的客户需求。Pace Industries 公司总经理 Jerry Peterson 说：“Pace Industries 一直将员工视为公司最大的资产，我们希望通过这次扩建，可以支持公司的可持续发展，以及帮助员工实现财务独立，提高他们在杰克逊的生活质量。”

田纳西州经济发展部议员 Stuart McWhorter 说，“Pace Industries 公司可以在任何一个工厂进行扩建，但选择了田纳西州，证明田纳西州拥有熟练劳动力和友好商业氛围的优势。杰克逊和麦迪逊县拥有强大的制造业基础，这将是支持 Pace Industrie 公司取得成功的沃土。” ■

Expanded Production, Capabilities At Godfrey & Wing

Godfrey&Wing 公司扩大产能

Godfrey & Wing, which manufactures and supplies equipment, sealants, and services to seal porous materials, has expanded vacuum impregnation production capacity at its North American service centers. The focus of this growth is to help manufacturers ensure part performance and build their business

Godfrey&Wing 公司制造并提供设备、密封剂和密封多孔材料提供服务，扩大了其北美服务中心的真空浸渗材料生产能力。这一扩能的重点是帮助制造商保证零件性能，在 2023 年和未来提升盈利能力。

profitability in 2023 and the future.

The expansion results from applying Godfrey & Wing's Production System (GPS) to improve efficiencies and eliminate waste. Production capacity has increased by more than 30% and lowered operating expenses.

The company said it is able to provide new and proven vacuum impregnation solutions for components ranging from die castings to electronics to graphite and EV batteries—which in turn enables them to serve manufacturers that are introducing new materials and product designs requiring vacuum impregnation.

"Our expansion is vital to solving manufacturers' porosity sealing challenges, said Alexander Alford, CEO of Godfrey & Wing. "This allows the best manufacturers worldwide to trust Godfrey & Wing to meet their requirements and the integrity of their bottom line."

Godfrey & Wing's service centers are in Aurora, Toledo, and Defiance, Ohio; Saginaw, Michigan; Milwaukee; and Santa Catarina, Mexico—all geographically positioned to serve the heart of the North American manufacturing industry. ■

本次扩能通过 Godfrey&Wing 公司的生产系统(GPS)来提高效率和减少能耗,产能增加了30%以上,运营费用也有所降低。

该公司表示,它能够为客户提供新的、经过验证的真空浸渗解决方案,此外,他们能够为那些引入需要真空浸渗工艺的新材料和产品设计的制造商提供服务。

Godfrey&Wing 公司首席执行官 Alexander Alford 表示:“公司的扩能对解决制造商的孔隙率密封问题至关重要。这使全球顶级制造商能够信任 Godfrey 和 Wing 公司,以满足他们的要求和根本利益。”

Godfrey&Wing 公司的服务中心分布于俄亥俄州的奥罗拉、托莱多和 Defiance, 密歇根州的萨吉诺, 密尔沃基, 以及墨西哥的圣卡塔琳娜, 都处于服务北美制造业中心的地理位置。■

GIFA **METEC** **GIFA** **METEC**

INDONESIA **INDONESIA** **SOUTHEAST ASIA** **SOUTHEAST ASIA**

13-16 SEPTEMBER 2023 **JAKARTA INDONESIA** **20-22 SEPTEMBER 2023** **BANGKOK THAILAND**

GIFA
METEC

JOIN US NOW! | www.gifa-indonesia.com | www.metec-indonesia.com
www.gifa-southeastasia.com | www.metec-southeastasia.com

GIFA & METEC INDONESIA / GIFA & METEC SOUTHEAST ASIA

Powered by The Bright World of Metals

For enquiries: Messe Düsseldorf Asia Pte Ltd
3 HarbourFront Place #09-02
HarbourFront Tower Two
Singapore 099254
Tel (65) 6332 9620 _ Fax (65) 6337 4633
gifa-indonesia@mda.com.sg _ metec-indonesia@mda.com.sg
gifa@mda.com.sg _ metec@mda.com.sg

Jointly organized by: PAMERINDO INDONESIA INDONESIA International Specialised Exhibitions

Organized by: Messe Düsseldorf Asia

Thermotec Acquires Pc Campana Mini Riser Division

Thermotec 公司收购 Pc Campana 公司微型冒口业务

THERMOTEC, Inc., a REFCOTEC & Koremart joint-venture, has acquired PC Campana's sand mini-riser division in Lorain, Ohio.

PC Campana has served the metals manufacturing industry with consumable products since 1969. Its mini-riser division was launched in 1984, producing exothermic sand mini risers that could withstand the forces of high-pressure sand molding.

Historically, THERMOTEC's feeding-aid offerings have been limited to vacuum-formed fiber options—the acquisition immediately widens its product offering to include a full line of mini-riser products, which the company says are popular due to their rigidity and superior feeding ability with improved yields.

Mini-riser production will take place at existing THERMOTEC facilities with stringent quality standards and short lead times. ■

THERMOTEC 公司是 REFCOTEC&Koremart 的合资企业，收购了位于俄亥俄州洛兰市的 PC Campana 公司的型微冒口业务。

PC Campana 公司自 1969 年以来一直为金属制造业提供耗材服务，其微冒口部门于 1984 年成立，生产能够承受砂型高压铸造的微型发热冒口。

以前，THERMOTEC 公司的浇口辅助产品仅限于采用真空成型纤维材料。此次收购将扩大其产品范围，包括全系列微型冒口产品，公司表示，这些产品因其刚性和优异的性能以及产量的提升而广受欢迎。

微型冒口将在现有的 THERMOTEC 工厂进行生产，该工厂具有严格的质量标准和较短的交付周期。■

Gm Secures Lithium Source With \$650 Million Investment, Supply Agreement

通用汽车公司签订 6.5 亿美元的锂投资和供应协议

General Motors Co. and Lithium Americas Corp. plan to jointly develop the Thacker Pass mine in Nevada, the largest known source of lithium in the U.S. and the third largest in the world. Under their agreement, GM will make a \$650 million equity investment in Lithium Americas—the largest-ever investment by an automaker to produce battery raw materials.

The Ultium platform is the foundation of GM's EV strategy, including the battery cells, modules, and pack, plus drive units containing electric motors and integrated power electronics. It underpins GM's EV architecture and was developed with a common set of components. Certain vehicles built from the platform will offer battery energy storage options from 50 to more than 200 kWh and driving range of up to 450 miles on a full charge.

Lithium Americas estimates the lithium extracted and processed from the project can support production of up to 1 million EVs per year. Lithium carbonate from Thacker Pass will be used in GM's proprietary

通用汽车公司 (General Motors Co.) 和美洲锂业公司 (Lithium Americas Corp.) 计划联合开发内华达州的 Thacker Pass 锂矿。Thacker Pass 矿是美国已知的最大锂矿，也是世界第三大锂矿。根据他们的合作协议，通用汽车公司将对美洲锂业公司进行 6.5 亿美元的股权投资，这是汽车制造商在电池原材料生产方面有史以来的最大投资。

Ultium 平台是通用汽车公司电动汽车战略的基础，包括电池、模块和电池组，以及包含电动机和集成电力电子设备的驱动单元，是通用汽车公司电动汽车架构的基础，并且由一组通用组件组成。基于该平台制造的车辆将提供 50 至 200kWh 以上的电池储能，续航里程在充满电后可



达 450 英里。

据美洲锂业公司预计，从该项目中提取和加工的锂每年可支持多达 100 万辆电动汽车的生产。来自 Thacker Pass 的碳酸锂将用于通用汽车专用的 Ultium 电池。锂是锂离子电池的关键材料，能够支持重复充电（包括快速充电）和放电，具有更高的能量密度，比其他类型的电池具有更多的可用容量。

通用汽车公司正在推出使用 Ultium 平台生产的一系列产品，包括卡车、SUV、豪华车和轻型商用车，其中有 GMC 悍马

Ultium battery cells. Lithium is a key material in lithium-ion batteries and stands up well to repeated charging and discharging (including enabling fast charging), delivers higher energy density, and offers more usable capacity than other battery types.

GM is launching a broad portfolio of trucks, SUVs, luxury vehicles and light commercial vehicles using the Ultium Platform, including the GMC HUMMER EV Pickup and SUV, GMC Sierra EV, Cadillac LYRIQ, Cadillac CELESTIQ, Chevrolet Silverado EV, Chevrolet Blazer EV, Chevrolet Equinox EV, BrightDrop Zevo 400 and BrightDrop Zevo 600.

“GM has secured all the battery material we need to build more than 1 million EVs annually in North America in 2025 and our future production will increasingly draw from domestic resources like the site in Nevada we’re developing with Lithium Americas,” said GM Chair and CEO Mary Barra. “Direct sourcing critical EV raw materials and components from suppliers in North America and free-trade-agreement countries helps make our supply chain more secure, helps us manage cell costs, and creates jobs.”

Lithium Americas President and CEO Jonathan Evans said, “The agreement with GM is a major milestone in moving Thacker Pass toward production, while setting a foundation for the separation of our U.S. and Argentine businesses. This relationship underscores our commitment to develop a sustainable domestic lithium supply chain for electric vehicles. We are pleased to have GM as our largest investor, and we look forward to working together to accelerate the energy transition while spurring job creation and economic growth in America.”

Production at Thacker Pass is projected to begin in the second half of 2026.

GM has announced four U.S. cell plants with annual capacity of 160 gigawatt hours, including the Ultium Cells joint venture plant with LG Energy Solution in Warren, Ohio, which is in production, and additional JV sites in Spring Hill, Tennessee, and Lansing, Michigan, that are scheduled to open in 2023 and 2024, respectively. The first three Ultium Cells plants are expected to create 6,000 jobs in construction and 5,000 in operations. The automaker is building EVs in two Michigan plants, one Tennessee plant and one Ontario plant, and its suppliers are investing to create a robust North America-focused supply chain for EV raw materials, processed material, and components, with major projects under way in California, Texas, Ohio and Quebec. ■

电动皮卡和 SUV、GMC Sierra 电动汽车、凯迪拉克 LYRIQ、凯迪拉克 CELESTIQ、雪佛兰 Silverado 电动汽车、雪佛兰 Blazer 电动汽车、雪佛兰 Equinox 电动汽车、BrightDrop Zevo 400 和 BrightDrop Zevo 600。

通用汽车公司董事长兼首席执行官 Mary Barra 表示：

“通用汽车已经获得了到 2025 年每年在北美地区生产 100 多万辆电动汽车所需的电池材料，公司未来将越来越多地使用国内资源，比如我们与美洲锂业公司合作建立了内华达州工厂。从北美自由贸易协定国家的供应商那里直接采购关键的电动汽车原材料和零部件，有助于保证供应链的安全，帮助公司降低电池成本，创造更多的就业机会。”

美洲锂业公司总裁兼首席执行官 Jonathan Evans 表示，“与通用汽车公司的合作将 Thacker Pass 锂矿业务推向一个重要里程碑，同时为公司的美国和阿根廷业务分离奠定了基础。这种关系突显了我们对国内电动汽车锂电池供应链走可持续发展的承诺。我们很高兴通用汽车公司成为公司最大的投资者，我们期待通过双方的合作，加快能源转型，同时促进创造就业机会和激励经济增长。”

Thacker Pass 锂矿的生产预计将于 2026 年下半年开始。

通用汽车公司宣布了 4 家年产能为 160 千兆瓦时的电池工厂，包括位于俄亥俄州沃伦已投产的与 LG 能源解决方案的 Ultium Cells 合资工厂，以及计划分别于 2023 年和 2024 年在田纳西州斯普林希尔和密歇根州兰辛开设的其他合资工厂。首批三家 Ultium Cells 工厂的建设预计将增加 6000 个就业机会，在运营中创造 5000 个就业机会。通用汽车公司正在密歇根州的两个工厂、一个田纳西州工厂和一个安大略省的工厂生产电动汽车，其供应商正在建设一个以北美为核心的强大的电动汽车原材料、加工材料和零部件供应链，主要项目位于加利福尼亚州、得克萨斯州、俄亥俄州和魁北克。■



2023中国(沈阳)

国际铸造及热加工展览会

2023 China (Shenyang) International Foundry and Thermal Processing Exhibition

9月1日-5日 | 沈阳国际展览中心
Shenyang International Exhibition Center

东北振兴，铸造先行！

协办单位

辽宁省铸造协会
吉林省铸造协会
黑龙江省铸造协会
内蒙古铸造协会
辽宁省机械工程学会铸造分会
沈阳市铸造协会
大连市铸造协会
齐齐哈尔市铸造协会
辽阳市铸造协会
本溪市铸造协会
本溪市机械工程学会铸造分会
彰武县铸造协会

支持单位

中国锻压协会
中国焊接协会
中国热处理行业协会
中国表面工程协会

联系方式

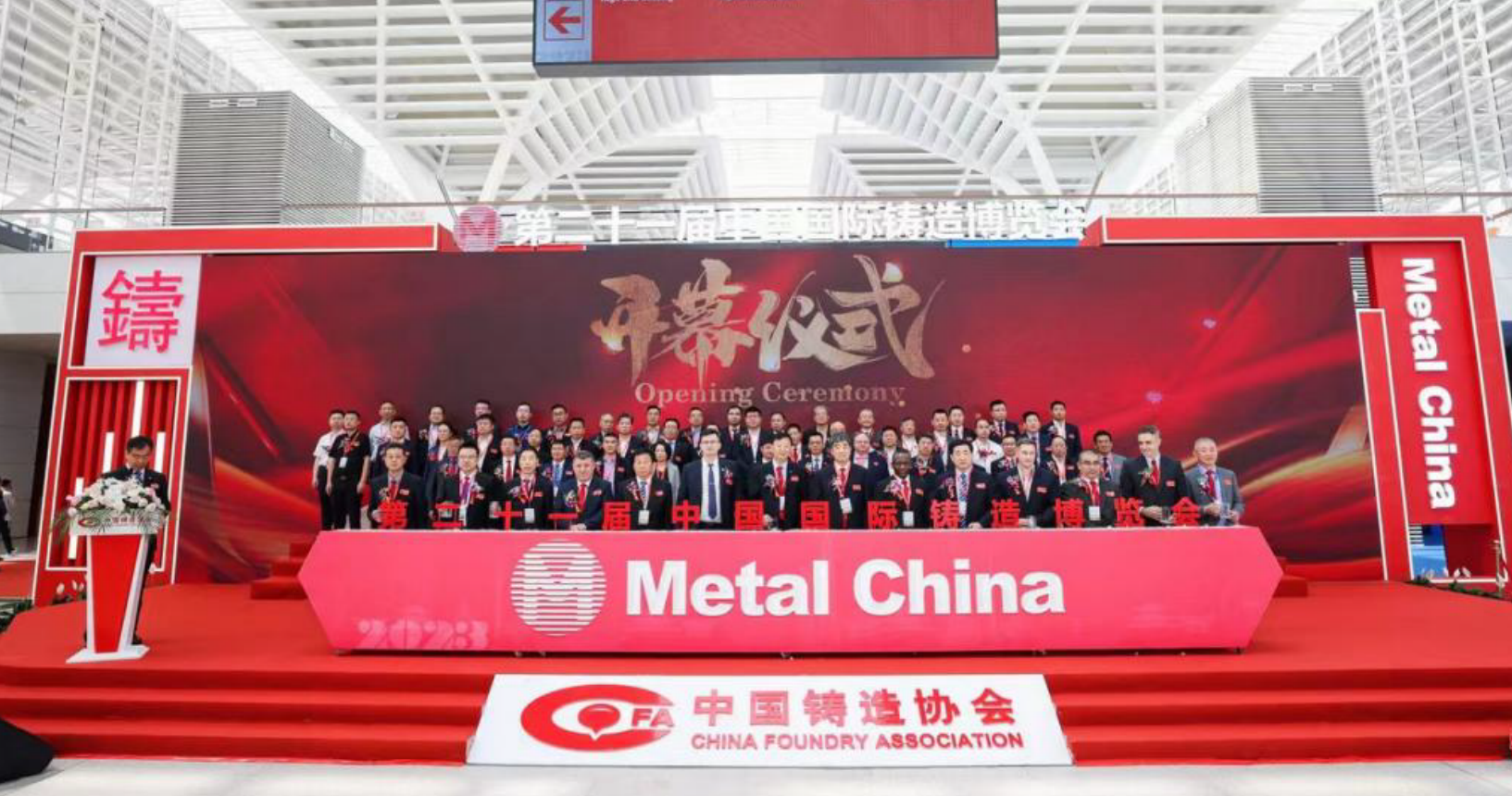
张舒婷 13381183592
王 闯 18911227990
陈海阔 13381183827



中国铸造协会官方微信平台



中国铸造协会展会微信平台



METAL CHINA 2023—A New Chapter for High-quality Development

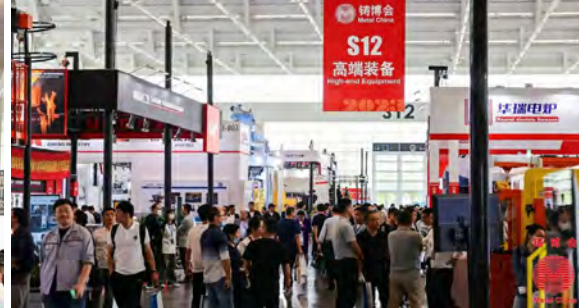
铸博会首次在天津举办，开启高质量发展新篇章

On May 8-11, METAL CHINA 2023 was successfully held at the National Convention and Exhibition Center (Tianjin), bringing together thousands of exhibits from the entire industry chain and nearly 1000 well-known enterprises from over 30 countries and regions, showcasing and opening a new chapter in the high-quality development of the foundry industry.

The exhibition covers an exhibition area of over 80,000 square meters, with a total of 6 themed pavilions and over 100 supporting events, attracting 127,616 professional visitors from more than 30 countries and regions. As the first regular event in the post-pandemic era, METAL CHINA once again showcases its industry influences with its 36-year history. The exhibition hall is filled with joyful and fruitful atmosphere, most of the exhibitors and visitors said, "there are many visitors visiting our booth, more than expected", "we have made several deals at this exhibition", "face-to-face communication is really exciting", "there are so many international buyers, we have established contacts and preliminary intentions", "it's a fantastic event with well-organization and round services", "the exhibition is burst

5月8-11日，第二十一届中国国际铸造博览会在国家会展中心（天津）举办，全球约30多个国家和地区的近千家知名企业参展，集中展示了铸造业高质量发展的新面貌。

“畅通双循环、赋能新发展、实现新增长”，本届展会展出面积达8万余平方米，共设6大主题展馆和百余项同期活动，吸引了全球30多个国家和地区的127616人次专业观众到会采购洽谈。积淀三十六载的中国国际铸造博览会又一次彰显出其行业影响力，展馆里充满着愉快且富有成效的气氛，展商和观众纷纷表示：“很多观众来到我们的展位洽谈，多得超乎想象”、“我们在这次展会上已经达成几笔交易”、“面对面交流的效果很好”、“这届展会的国际采购商很多”、“这是一届非常棒的展会，



of vitality", "it's a worthwhile trip", "we are looking forward to the next METAL CHINA", etc..

In order to achieve the "mutual satisfaction" of exhibitors and visitors, METAL CHINA 2023 is consisted of 6 themed halls of advanced foundry equipment, green raw and auxiliary materials, high-end casting, featuring in investment casting area, wear-resistant parts for mining and metallurgical heavy machinery and engineering machinery, industry cluster area, art casting area, etc.; at the same time, there are Peru and Kenya pavillion shows the interation of foundry and other elements. New technologies, products, and purchase orders have built a bridge for the world foundry industrial chain.

During the four exhibition days, more than 100 exciting events were staged, focusing on the hot topic of high-quality development, including new product launches, theme forums, sourcing fair, strategic signing activities, and award ceremonies; Leading enterprises and SMEs present a vibrant development trend; There is a whole industrial chain, from high-end castings to intelligent equipment, and green advanced materials. New products, technologies, solutions, and trends are intertwined here... joyful and thoughtful discussions, innovative solutions are blooming, showing a thriving industry trend.

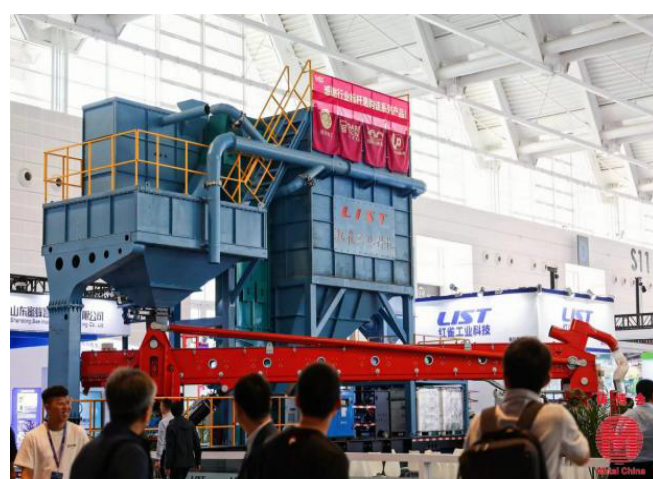
Meanwhile, as another important part of the 7th China Foundry Festival, the 19th China Foundry Association Annual Meeting was held, during which China Foundry Industry Data was released, the total casting production of China in 2022 reached 51.7million tons, down 4.3% year on year. The theme of this annual meeting is "New

组织有力、服务周到”、“展会呈现出行业活力”、“不虚此行”、“期待下一届展会” ……

为实现参展商和观展者的“双向奔赴”，本届铸博会包含先进铸造装备、绿色环保原辅材料、高端铸件主题展馆，并设有精密铸造展区、矿冶重机与工程机械耐磨件展区、铸造产业集群展示区、艺术铸造等特色展区，优质铸件金奖企业、国内外先进铸造装备企业、绿色环保铸造原辅材料企业将悉数亮相；同时，秘鲁、肯尼亚国家展团、诸多地方展团“盛装出席”。来自全球的铸造新技术、新产品及海量采购订单，为畅通产业链搭建了桥梁。

四天展期里，新品发布、主题论坛、采购洽谈、战略签约、颁奖评选……100余场精彩活动轮番上演，聚焦高质量发展最热话题；名企强企业实力云集，呈现产业发展勃勃生机；从高端铸件到智能化设备，再到绿色环保铸造材料，新产品、新技术、新方案、新趋势在这里交织、碰撞……交谈声不绝于耳，创新方案百花齐放，呈现出蓬勃发展的行业态势。

与此同时，“第七届中国铸造节”重磅节目——“第十九届中国铸造协会年会”在天津召开并重磅发布了“2022





Concept, New Pattern, New Development", several sub forums were held including the topics of nonferrous alloys and special casting, advanced steel casting technology, automotive castings and lightweight technology, advanced cast iron technology, cutting-edge technology, and green low-carbon intelligent casting.

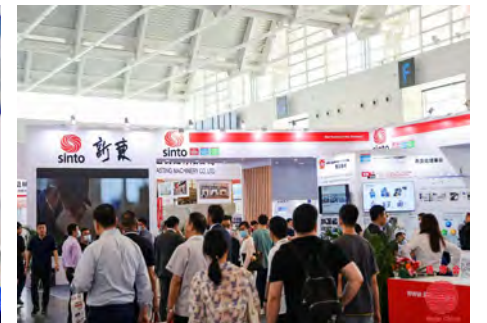
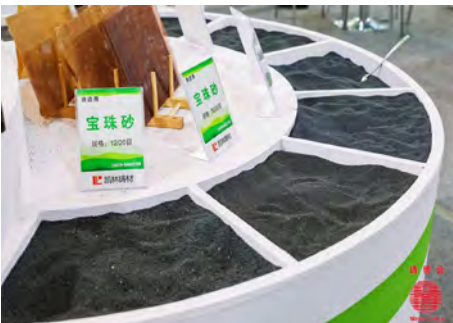
METAL CHINA 2023 has concluded with a big success. A brand new METAL CHINA will be staged in National Exhibition and Convention Center (Shanghai) again, from July 4-7, 2024. A machinery industry mega event, covering foundry, diecasting, metalforming, heat treatment, surface engineering, welding, jointly created by 5 industry associations, will grandly display at 8 themed exhibition halls, with an exhibition area of 230,000 square meters, showing the whole manufacturing industry chain. Looking forward to your continued attention and participation.

For more information, please visit www.expochina.cn or email to limengmeng@foundry.com.cn ■

年度中国铸造行业数据”。2022年中国各类铸件总产量为5170万t,同比下降4.3%。本届年会主题为“新理念、新格局、新发展”,有色合金及特种铸造、先进铸钢技术、汽车铸件及轻量化技术、先进铸铁技术、铸造前沿技术、绿色低碳智能铸造等主题分论坛精彩举办。

津门收官,沪上接续!由中国铸造协会、中国锻压协会、中国热处理行业协会、中国表面工程协会、中国焊接协会五家行业协会集各自优势打造的机械行业大展将于2024年7月4-7日在国家会展中心(上海)昂扬启航,8大主题展馆、23万平米的展出面积、囊括基础制造工艺全产业链。期待您的关注和参与。

更多信息,请访问 www.expochina.cn ! ■



China Exhibitor List at GIFA 2023

中国铸造在 GIFA

No.	公司名称 Company name	展位号 Booth No.	主要产品 Main products	Email
1	郑州华友矿产品有限公司 ZHENGZHOU SINABUDDY MINERAL CO., LTD	 12A23-1	棕刚玉、白刚玉、板状刚玉、莫来石、尖晶石、空心球、碳化硅和石墨。Brown Fused Alumina, White Fused Alumina, Tabular Alumina, Alumina Balls, Bubble Alumina, Fused Mullite, Spinel, Black Silicon Carbide, and Graphite.	sunnygao@sinabuddy.com
2	江苏有色金属进出口有限公司 JiangSu Nonferrous Metals I/E Corp. Ltd	 12A23-2	公司成立于 1984 年 12 月经中国有色金属工业总公司批准成立，注册资本 558 万元。Established in December 1984 with the approval of the China Nonferrous Metals Industry Corporation, started with a registered capital of 5.58 million yuan.	lxw@jsmetal.com
3	河北善初新型材料有限公司 Hebei Shanchu New Material Co., Ltd.	 12A25	专业生产泡沫陶瓷过滤器及玻璃纤维过滤网，用于熔融金属过滤。Main products include sic ceramic foam filter, alumina ceramic foam filter, zirconia ceramic foam filter, extruded ceramic filter, aluminum filtration cloth filter, and silica mesh filter for iron and steel.	james@bdningxin.com.cn
4	滕州市丰尔达金属制品有限责任公司 TENGZHOU FENG ERDA METAL PRODUCTS CO., LTD	 12D16	钢丸、钢砂、钢丝切丸、不锈钢丸、铝丸、铜丸、级配磨料；硅铁、铬铁、锰铁、增碳剂等。steel shot, steel sand, steel wire cutting shot, stainless steel shot, aluminum shot, copper shot, graded abrasives; etc.W	china_b@fengerda.com
5	河南伟业新材料有限公司 Henan Weiye New Materials Co.,Ltd	 12E23-A	“盛世伟业”牌石墨化增碳剂、铸造级碳化硅、防脉纹剂、宝珠砂、PUCB 冷芯复合砂、氮化锰等。“Shengshi Weiye” brand graphitized recarburizer, casting grade silicon carbide, anti-veining additive, ceramic foundry sand, PUCB composite sand and manganese nitride.	chinaweiye@pdswy.cn
6	济南科世威新材料有限公司 JINAN COSAVE NEW MATERIAL CO.,LTD	 12E23-B	主要产品有增碳剂，铁合金，孕育剂，球化剂，过滤器，炉衬材料。recarburizers, ferroalloys, inoculant, nodulant, filters, and furnace lining materials.	cherry@cosave.cn
7	淄博大亚金属科技有限公司 ZIBO TAA METAL TECHNOLOGY CO.,LTD	 12E23-C	高低碳钢丸、钢砂、不锈钢丸、不锈钢砂、钢丝切丸、强化钢丸、铝丸、锌丸、铜丸、海绵磨料等抛丸、喷砂材料；高端抛丸设备及配件。High/Low carbon steel shot,Steel grit,Stainless shot,Stainless grit,Steel cut wire shot,Peening shot,Aluminum shot,Zinc shot,Copper shot.	abrasive.b@taa.net.cn
8	武汉建恒同创金属科技有限公司 Wuhan Jianheng Matel Technology Co., Ltd.	13B04	http://www.jhcastings.com/	lqmhust@gmail.com
9	河北联硕机械制造有限公司 HEBEI LIANSHUO MACHINERY MANUFACTURING CO.,LTD	 14C06-A	供应各种钢的高牌号精密铸件和机加工零件。wide variety of high-grade precision castings and machined parts in all kinds of Iron, steels with serving a wide range of fields in Automotive Industry, Fluid Handling, Construction Equipment, Building Hardware, Railway and Transportation etc.	sales@lsmachinery.com
10	烟台冰轮智能机械科技有限公司 YANTAI MOON INTELLIGENT MACHINERY TECHNOLOGY CO.,LTD	 14C06-B	机床类铸件、压缩机类铸件、发电设备类铸件、内燃机类铸件、泵阀类铸件、矿山机械类铸件、低压铝合金零部件。Machine tool castings, compressor castings, power generation equipment castings, internal combustion engine castings, pump and valve castings, mining machinery castings, low pressure aluminum alloy parts.	chenxuema@126.com
11	山西容川国际贸易有限公司 WINDUS Global, Inc.	 14C06-C	www.china-windus.com	Steven.song@china-windus.com
12	宁波金球机电铸造有限公司 Ningbo Jinqiu Mechanical and Electrical Casting Co., .Ltd	 14C06-D	主要产品有转向座、动臂支撑、连杆、挖掘机底盘总成、钢轮、连接器，产品广泛用于工程机械等领域。Specializes in steel casting parts and fabrication parts, heat treatment and machining. Our products are widely used in engineering machinery and other fields.	jinqiu@jinquiucasting.com
13	UGM GROUP LIMITED	 14C06-E	生产石墨电极，铝酸钙，增碳剂，石墨化石油焦，煅烧石油焦，碳块，碳化硅。Our company (UGM) is a general corporation to produce the carbon products.	
14	河北铸峰新材料科技有限公司 Hebei Zhufeng New Material Technology co., Ltd.	 14C06-F	一家主要生产石墨电极的工厂，电极有三种级别，RP, HP, UHP。Mainly producing graphite electrode, electrode has three grades, RP, HP, UHP.	
15	上海爱仕达机器人有限公司 Shanghai ASD Robot Co.,Ltd.	15A11	公司主要产品有铝合金缸体、缸盖、机器人本体铸件、新能源汽车电机壳等汽车轻量化产品。Aluminium alloy cylinder block, cylinder head, robot body casting, new energy automotive motor shell and other automotive lightweight products.	asdfwl@chinaasd.com
16	天津凯邦碳素技术开发有限公司 TIANJIN FEDERAL CARBON TECHNOLOGY & DEVELOPMENT CO., LTD.	 16A01	立式离心铸造机、卧式离心铸造机、离心铸造模具、电渣重熔坩埚、电渣重熔结晶器 Vertical centrifugal casting machine; Horizontal centrifugal casting machine; Centrifugal casting mold.	tony@centrifugalcastmachine.com
17	山东湖西王集团铸业有限公司 Shandong Huxi Wang Group Foundry Co.,Ltd	 16B02	减/差速壳体，半轴套管支撑，车桥，传动齿轮箱，商用车轮毂，轮毂支架，转向节，横梁，支架，传动壳体，机器人底座手臂 Centre Beam, Gear Box, Hub Carrier, Carrier-Diff, Balancing Shaft Bracket Wind Power Housing, Connection Housing, Robot Base, Robot Connection Plate.	susan.yin@sdhxw.com
18	青岛弗林斯曼机械制造有限公司 Qingdao Fringsman Machinery Manufacturing Co.,Ltd	 16A14	一家专业生产抛丸清理设备，除尘环保设备和高耐磨铸件、高耐磨加工件的生产型企业。Specializes in shot blasting cleaning equipment, dust removal and environmental protection equipment, as well as high wear-resistant castings and processed parts.	tao@fringsman.com
19	爱司凯科技股份有限公司 AMSKY Technology Co., Ltd.	 16A18	http://www.amsky.cc/	zhangj@amsky.cc
20	玫德集团有限公司 JINAN MEIDE CASTING CO.,LTD	 16B16-1	http://www.meide-casting.com/cn	allen.zhao@meide-casting.com
21	江苏耐琦金刚石工具有限公司 Jiangsu Naiqi Diamond Tools Co.,Ltd.	16B16-2	http://www.naigcn.com	Customer0@NQ-Diamond-tools.com
22	共享智能装备有限公司 KOCCEL INTELLIGENT MACHINERY LIMITE	 16B16-3	粘结剂喷射铸造、金属、陶瓷类 3D 打印设备研发制造、3D 打印数字化工厂建设、3D 打印产品及服务。Binder jet casting, metal and ceramics 3D printing equipment R & D and manufacturing, 3D printing digital factory construction, 3D printing products and services.	Shirley.Lee@koccel.com
23	大连金浩隆机械制造有限公司 Dalian Jinhaolong Machining Manufacturing Co.,Ltd.	 16F03	各种合金钢，包括碳钢，马氏体不锈钢，奥氏体不锈钢，双相钢，高温合金钢，哈氏合金钢等，用于泵、阀及压缩机等领域。Carbon steel, martensitic stainless steel, austenitic stainless steel, duplex, super austenitic duplex, high temperature alloy steel, Hastelloy for pumps, valves, compressors.	15898120907@139.com
24	宁波合力科技股份有限公司 Ningbo Heli Technology Shareholding CO.,Ltd	 17D50	提供各类铝镁合金及高强度模具设计制造、产品开发、材料研究、技术支持的一站式服务。专注于新能源和轻量化领域。Provide one-stop service for all kinds of aluminum alloy and high-strength steel mould design and manufacturing, product development, material research and technical support.	young@helimould.com

中国铸造协会 CHINA FOUNDRY ASSOCIATION

联系人 Contact: Ms. YOU Yang, youyang@foundry.com.cn Ms. Sofia Nie, niefei@foundry.com.cn

Implementation of Casting Simulation for Increased Engine Performance and Reduced Development Time and Costs – Selected Examples from FORD R&D Engine Projects

通过铸造模拟来实现发动机性能的提升以及开发时间和成本的降低——福特发动机 R&D 项目

Prof.Dr.-Ing. Dr.h.c. R.J. Menne, Dr.-Ing. U. Weiss, Ford Forschungszentrum Aachen GmbH, Aachen;
Dr.-Ing. A. Brohmer, Ford-Werke GmbH, Köln;
Dr.-Ing. A. Egner-Walter, Dipl.-Ing. M. Weber, P. Oelling, MAGMA GmbH, Aachen

Abstract

The application of CAE is continually gaining in importance in all areas of engine development. This is especially true for the simulation of the casting process as well as for the following heat treatment. Although the durability analysis of the finished component has long been an established part of the development process, CAE-technologies for the simulation of the manufacturing process have only recently come into focus.

The advantages of simulation at an early stage are obvious. Only by using the simulation of the manufacturing process is it possible to determine the distribution of inhomogeneous mechanical properties (hardness, elongation and yield strength) as well as residual stresses and to consider these properties in the design optimization process, especially in FEM calculations. The quality of the CAE analysis is significantly improved, therefore the full potential of the cast material can be taken advantage of in early design stages. On the other hand, through the optimization of heat treatment using simulation, the performance of the engine can, for example, be increased without cost-intensive design changes within the existing design concept.

In this paper the involved companies, using selected examples from continuing R&D projects, will illustrate the potential to reduce the development time while simultaneously increasing the quality of the component. The methodology of simulating the casting process has been integrated as a key technology into the development process of cylinder heads and blocks at Ford Motor Company and has led to a

摘要：

在发动机开发的各领域，CAE 的应用日益重要。特别是对于铸造工艺以及随后的热处理模拟尤其如此。虽然成品部件的耐用性分析长期以来一直是开发过程的一部分，但用于模拟制造过程的 CAE 技术直到最近才成为焦点。

早期模拟的优势非常明显，只有通过对制造过程的模拟，才能确定非均匀的力学性能（硬度、延伸率和屈服强度）以及残余应力的分布，并在设计优化过程中考虑这些性能，特别是在 FEM 计算中，CAE 分析的质量有了显著的提高，因此可以在早期设计阶段充分利用铸造材料的潜力。另一方面，通过模拟对热处理工艺进行优化，例如，在现有的设计概念中，不需要进行成本密集型的设计变更，就可以提高发动机的性能。

在本文中，相关公司将利用持续研发项目中的部分案例，说明在减少开发时间的同时提高产品质量的潜力。铸造工艺的模拟已作为福特汽车公司气缸盖和缸体开发过程中的关键技术集成，并显著降低了开发时间和成本。

1. 介绍：发动机开发的要求

过去的 3-5 年中，发动机的开发经历了快速发展过程，改善最显著的部分是重量、空间设计和性能；对比 10 年前，这些特性以前所未有的开发速度得到了提高（图 1）。根据开发目标，发动机在投入生产时进行了以下改进：

significant reduction in development times and costs.

1. Introduction - Requirements for Engine Development

Engine development has undergone a tremendous development process in the last three to five years. The cornerstones of this development are weight, design space and performance; features that have been enhanced with a development rate that has not been experienced in the decade before (Fig. 1). Depending on the development goal, engines went into production with the following improvements:

- performance increase by 50% with same total weight, or
- reduction of engine weight and design space by 25% with same performance.

The customer highly appreciates and honors these improvements, where especially resulting features like reduced gasoline consumption, crash security, and the overall driving fun deliver high customer value. The next development goals are gasoline engines with 90 kW/L, 140 bar, and diesel engines with 80 kW/L, 200 bar, respectively. With this 'quantum leap' in engine development, companies are forced to break new ground in many areas. However, these ambitious goals can not be met with common procedures. New processes and methods are required to successfully enter new territory.

2. Future Development Process

The general development targets have not really changed:

- Reducing development times
- Exploiting the potential of design and material
- Reducing costs in the development process
- Reducing component costs and production costs

The approach to support physical component tests with numerical processes has successfully been used before and led to an extensive use of CAE in today's engine development process:

- Structural analysis (durability, acoustics/ NVH)
- Flow simulation (intake/exhaust gas system, in-cylinder flow, simulation of oil circulation and water jacket, crank case/ PCV system)
- Dynamics of multibody systems (valve train, timing gear, crankshaft, piston)
- Simulation of friction and wear, bearing calculation

The individual CAE methods have reached such a quality and accuracy level that aspects like production

- 当总重量相同时，性能提高了 50%，或
- 性能相同，发动机重量和空间设计减少 25%。

客户非常赞赏和尊重这些改进，特别是由此产生的效应，如减少油耗，提升碰撞的安全性和整体驾驶乐趣，带来了很高的客户价值。下一个发展目标分别是 90kW/L、140 bar 的汽油发动机和 80kW/L、200 bar 的柴油发动机。随着发动机开发的“重大突破”，公司不得不在许多领域开辟新的道路，然而，这些雄心勃勃的目标不能通过常规的流程来实现，成功进入新的领域需要新的工艺和方法。

2. 未来的开发工艺

总的开发目标一如既往：

- 减少开发时间
- 提升设计和材料的潜能
- 降低工艺开发的成本
- 降低零部件成本和生产成本

用数值过程支撑零部件物理的测试方法在以前已经成功地使用过，并使得如今 CAE 在发动机开发过程中广泛使用：

- 结构分析（耐久性、声学 / NVH）
- 流量模拟（进 / 排气系统、缸内流量、油循环和水套模拟、曲轴箱 /pcv 系统）
- 多体系统动力学（气门机构、正时齿轮、曲轴、活塞）
- 摩擦和磨损模拟，承载力计算

独立的 CAE 方法已经达到了一定的质量和精度水平，在生产、公差和生产中的参数变化等方面的影响越来越大。

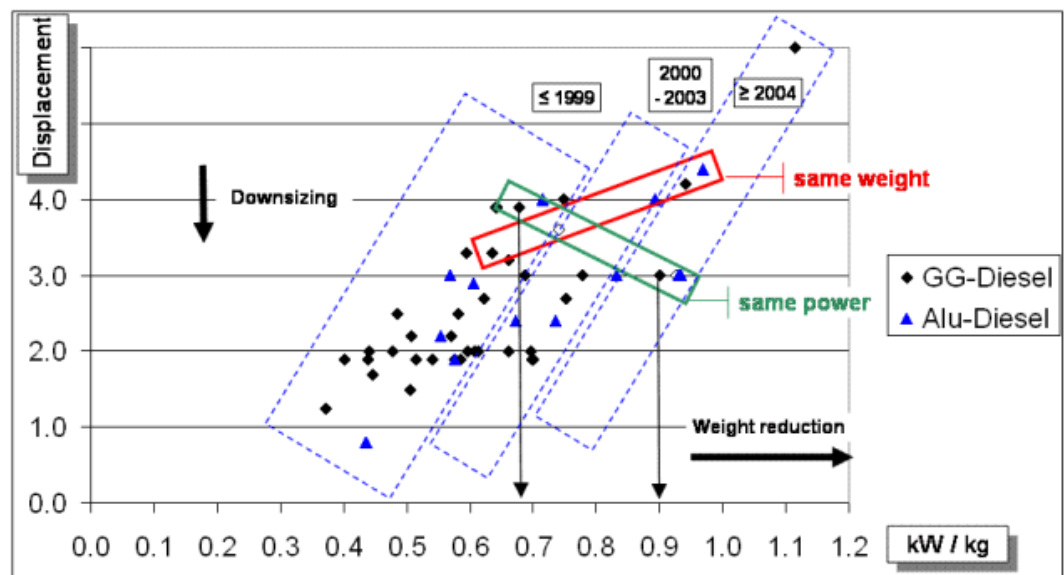


Figure 1: Development trends regarding specific power output and displacement
图 1：比功率输出和排量的发展趋势

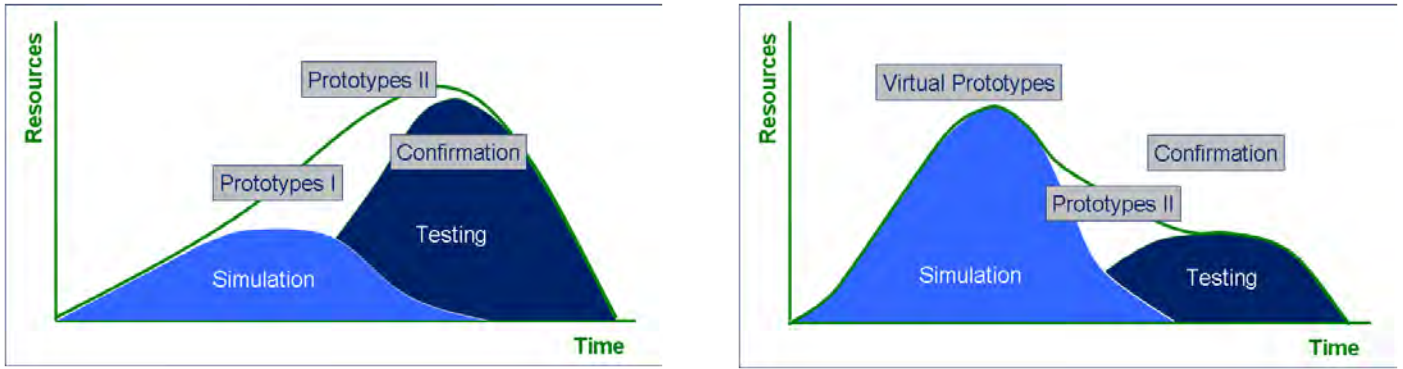


Figure 2: Resource shift following the Integrated CAE Development Process
图 2：集成 CAE 开发工艺后的要素变化

influences, tolerances, and parameter variation in production have increasingly more impact. Consequently, current CAE developments are mainly focused on production processes:

- Failure hypotheses - considering local properties (microstructure, material defects, inhomogeneities) and more accurate material data (chemical composition, elevated temperatures)

- Manufacturing simulation - casting, forging, heat treatment, machining, joining etc.

This is the basis for the future development process: not only further development but integration of CAE methods, i.e. a complete and Closed Loop CAE Procedure for the simultaneous optimization of component and production process. This is the only way to reach the required quality level in the development process to achieve zero prototyping, substantially reducing development time as well as development costs (Fig.2). At the same time, the Closed Loop CAE Procedure together with the resulting improved analysis quality is the prerequisite to develop next generation high performance components.

因此，目前的 CAE 的发展主要集中在生产过程中：

- 失效假设 - 考虑局部特性（显微结构、材料缺陷、不均匀性）和更准确的材料数据（化学成分、高温）

- 制造模拟 - 铸造、锻造、热处理、机加工、焊接等。

这是未来开发过程的基础：不仅是巩固和提高，而是 CAE 方法的整合，即完整的闭环 CAE 流程，用于同时优化零部件和生产过程，这是在开发过程中达到所需的质量水平唯一途径，以实现零样件，从而大大减少了开发时间和开发成本（图 2）。同时，闭环 CAE 流程以及由此产生的改进的分析质量是开发下一代高性能零部件的先决条件。

3. 铸造工艺模拟可以优化开发过程

发动机部件零样件开发过程的重要部分是模拟铸造过程和热处理是否适用（图 3）。目的是确定材料性能的不均匀分布、残余应力、零部件设计的影响、工艺参数及其

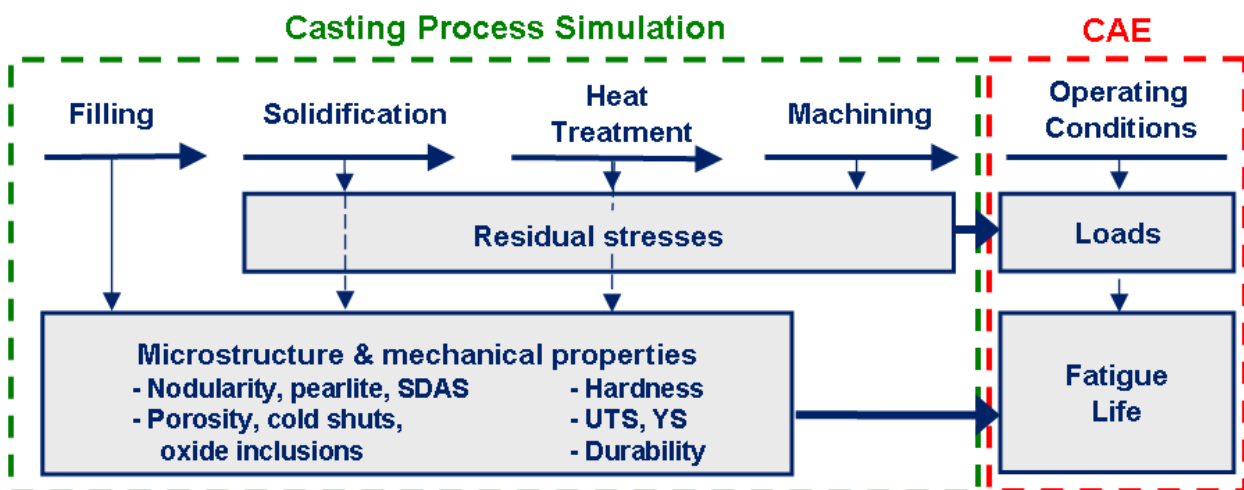


Figure 3: Impact of casting and manufacturing processes on the component performance
图 3：铸造和制造工艺对零部件性能的影响

3. Casting Process Simulation for the Optimization of the Development Process

An important part of the zero prototyping development process for engine components is the simulation of casting processes and heat treatment if applicable (Fig.3). The objective is to identify the inhomogeneous distribution of material properties, residual stresses, the influence of component design, process parameters and their variations, and last but not least the influence of the cast alloy. The simulation of the complete casting process provides results like.

- Hardness (required optimization parameter regarding the machining of iron castings that are of increasingly lightweight structure)

- Yield limit, tensile strength, SDAS, and further microstructural characteristics (important parameters for the component behavior under load as well as for failure life calculations)

- Porosities (influence on function and fatigue life)

Residual stresses are computed by simulating the casting or heat treatment process and are being implemented in the fatigue calculation as 'pre-load of the component'.

The casting process simulation is easily integrated into the conventional CAE procedure. Due to the parallel integration the development process is not prolonged in spite of the significant quality improvements (Fig.4).

4. FORD Engine Development - Examples

The potential of casting simulations covers all iron and nonferrous alloys as well as all casting processes. Foundries use casting simulation on a regular basis for the optimization of casting technology and production parameters. The objective is to avoid cold laps, porosities and inclusions, and in the case of cast iron components also to analyze the microstructure for the calculation of hardness and yield point. The main parameter for CGI (compacted graphite iron) is nodularity (Fig.5).

Affected by the design, some areas cool down much faster than others leading to locally increased hardness values in cast iron (Fig.6). The simulation identifies this problem making it possible to respond as early as in the virtual development phase. Additionally, because of the high sensitivity of the MAGMA simulation it is possible to calculate the influence of alloy modifications even in the range

变化, 以及最后且重要的, 铸造合金的影响。整个铸造工艺的模拟的结果如下:

- 硬度(关于轻量化结构的铸铁件加工所需的优化参数)
- 屈服极限、抗拉强度、SDAS 和进一步的微观结构特性(载荷下零件状态以及失效寿命计算的重要参数)

- 孔隙率(对功能和疲劳寿命的影响)

通过模拟铸造或热处理工艺来计算残余应力, 并在疲劳计算中作为“零件的预载荷”来实现。

铸造工艺模拟很容易集成到传统的 CAE 程序中。由于并行集成, 质量有了显著的改进, 而且开发过程并没有延长(图 4)。

4. 福特发动机的研发

铸造模拟的潜力涵盖黑色和有色合金以及所有铸造工艺。铸造厂定期采用铸造模拟的方法来优化铸造工艺和生产参数, 目的是避免冷隔、缩孔和夹杂物, 在铸铁件中, 也需要分析微观结构, 从而计算硬度和屈服点。CGI(蠕墨铸铁)主要关注的参数是球化率(图 5)。

受工艺设计的影响, 某些区域比其他区域冷却快得多, 导致铸铁硬度值增加(图 6)。模拟验证了这个问题, 使其能够早在虚拟开发阶段就采取措施。此外, 由于 MAGMA 模拟的高灵敏度, 即使在工艺变化的范围内, 也可以计算出合金变化的影响。因此, 考虑到局部增加的硬度值, 通过闭环 CAE 程序来确定最佳的合金方案。

此外, 不均匀的冷却速率会导致力学性能不一致(图

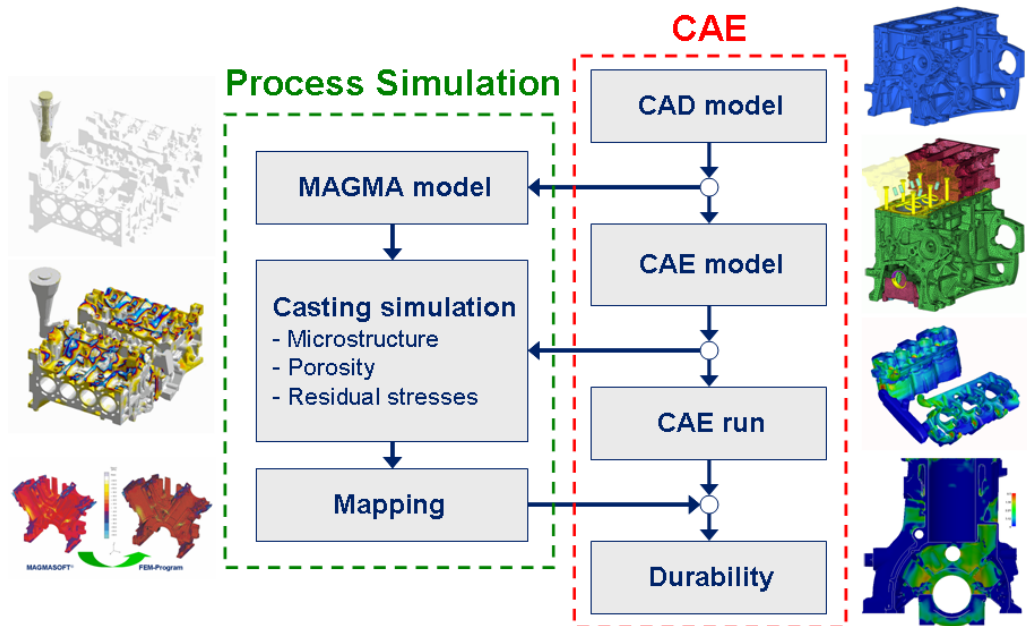


Figure 4: Integration of CAE and casting simulation
图 4 : CAE 与铸造模拟的集成

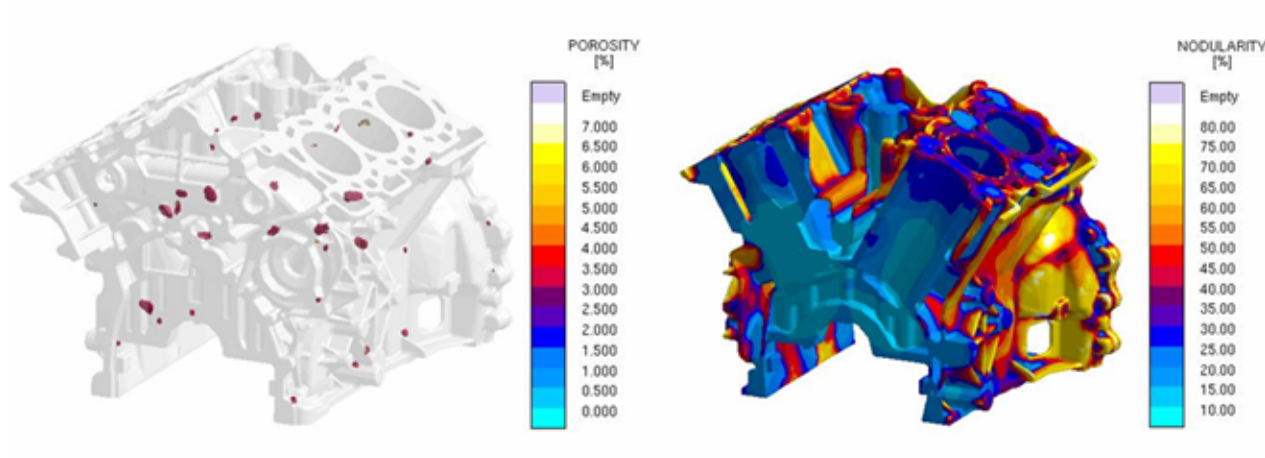


Figure 5: Porosity and nodularity distribution (section) in a CGI block
图 5：螺墨铸铁缸体孔隙率和球化率分布（部分）

of process variations. Consequently, the Closed Loop CAE Procedure is the way to identify the optimal alloy considering the locally increased hardness values.

What is more, inhomogeneous cooling rates cause inhomogeneous mechanical properties (Fig.7) that cannot be neglected in the new generation of high performance components and hence need to be considered in the Closed Loop CAE Procedure. The challenge is to combine production simulation and failure life calculations in an integrated CAE tool.

The zero prototyping development process adds the calculation and integration of residual stresses to the simulations that are traditionally rather foundry-relevant. The residual stresses in engine blocks are often as high as the assembly and operating loads themselves. However, the formation of residual stresses follows completely different principles than the formation of thermal and mechanical operating stresses. Consequently, superposing these stresses does not only lead to increased stresses but also to compensations, with the according impact on fatigue life.

7)，这在新一代高性能零部件中是不能忽视的，因此需要在闭环 CAE 流程中加以考虑。挑战在于将生产模拟和失效寿命的计算结合在一个综合的 CAE 工具中。

零样件开发过程将残余应力的计算和集成添加到传统的与铸造相关的模拟中。发动机缸体中的残余应力通常与装配和操作负载本身一样高，然而，残余应力的形成与热应力和机械应力的形成的原理完全不同。因此，叠加这些应力不仅会导致应力的增加，也会相互抵消，并对疲劳寿命产生相应的影响。

集成 CAE 程序将残余应力作为第四载荷，与三种传统载荷：装配、温度和峰值压力之间的重要性相同，在失效寿命计算中考虑了局部力学性能（图 9）。

稍加修改后，该程序也用于气缸盖和其他热处理零部件，由于零部件中存在明显的温差，主要在淬火过程中产生残余应力（图 10）。模拟考虑了淬火介质中的传热和由此产生的冷却效应。

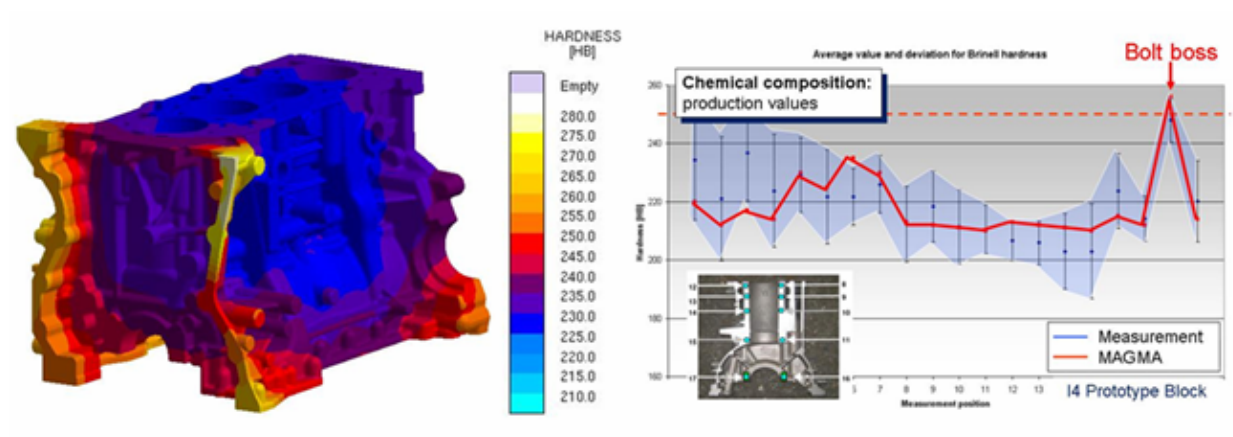


Figure 6: Hardness distribution and simulation sensitivity for GJL
图 6：硬度分布和模拟灵敏度

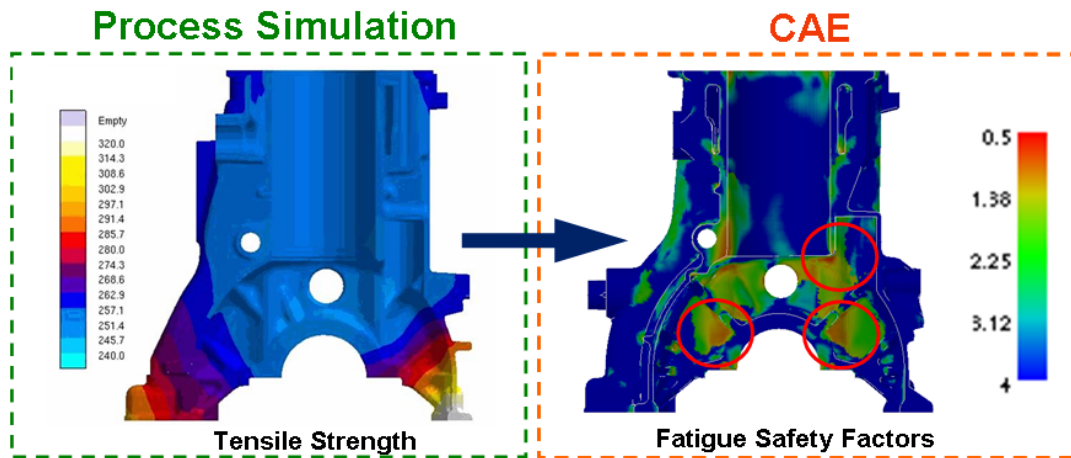


Figure 7: Local mechanical properties and fatigue safety factor prediction
图 7：局部力学性能和疲劳安全系数的预测

The integrated CAE procedure includes residual stresses as the fourth load case with the same importance as the three traditional load cases assembly, temperature, and peak pressure. The local mechanical properties are considered in the failure life calculations (Fig.9).

Slightly modified, this procedure is also used for cylinder heads and other heat treated components, where the dominant residual stresses are created during the quenching process due to the significant temperature differences in the component (Fig.10). The simulation considers the heat transfer in the quenching medium and the resulting cooling behavior.

Residual stresses in high-strength heat treated cylinder heads are in some cases so close to failure limit that prototype failure can already be explained with a simple residual stress analysis. (Fig.11). Thus, also for the consideration of heat treatment in the development process of high performance components, the integrated CAE procedure is indispensable.

Aluminum cylinder blocks with gray cast iron inserts

高强度热处理气缸盖中的残余应力在某些情况下非常接近失效极限，以至于用简单的残余应力分析已经可以解释原型失效（图 11）。因此，在高性能零部件的开发过程中考虑热处理，集成 CAE 程序是必不可少的。

带有灰铸铁缸套的铝合金气缸体也有类似的情况，缸筒壁残余应力是加工过程中开裂的原因，在生产开发过程中，可以采取适当的措施来解决缸筒壁开裂。然而，残余应力仍将存在于零件中，并将对这些未来高性能发动机的疲劳寿命产生影响（图 12）。因此，集成的 CAE 程序对于开发高应力铝合金发动机部件至关重要，无论它们是否经过热处理。在处理混合零部件时尤其如此。

另一个主题是使用虚拟实验设计开发新技术。带铸铁缸套的铝合金缸体的稳健设计需要解决以下任务：

- 衬套以及缸筒壁的最佳壁厚比
- 控制型腔或者高压模具中衬套的预热。

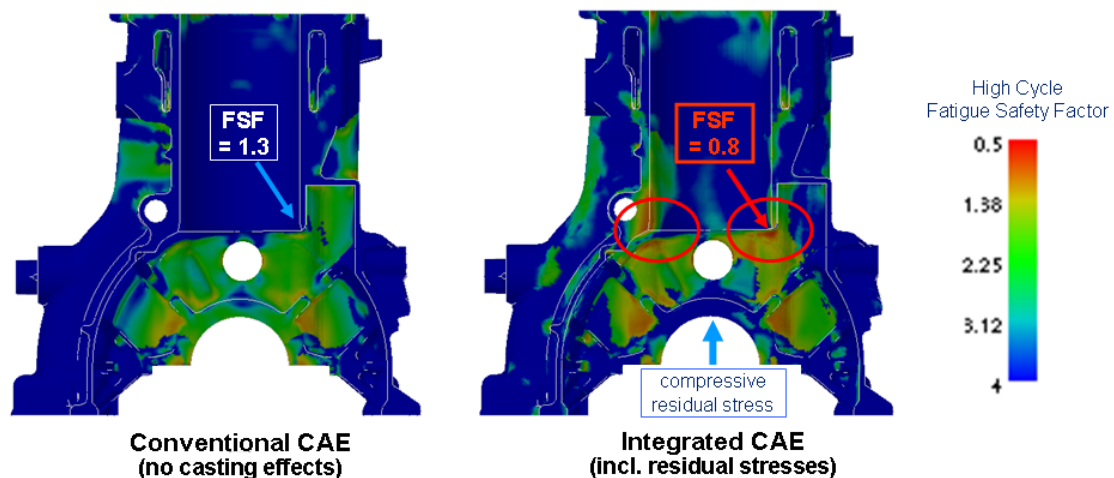


Figure 8: Impact of residual stresses on failure life prediction
图 8：残余应力对失效寿命预测的影响

show a similar picture. The residual stresses in the cylinder bridges are the reason for bridge cracks during machining. The appropriate actions to address the bridge cracks can be taken during the production process development. However, residual stresses will still be present in the component and will have an impact on the fatigue life of these future high performance engines (Fig.12). Consequently the integrated CAE procedure is essential for the development of highly stressed aluminum engine components, whether they are heat treated or not. This is especially true when dealing with hybrid components.

Another topic is the use of a virtual DoE (Design of Experiment) for the development of new technologies. The robust design of aluminum crank cases with cast iron cylinder liner inserts requires e.g. to address the following tasks:

- Optimum wall thickness ratio of liner and bore bridge
- Controlled preheating of the liners in the core package or a high pressure die casting die.
- Using the appropriate casting parameters to avoid cold laps
- Securing optimum heat transfer at operating temperature with the aluminum shrink-on process
- Ensure sealed bond between liner and aluminum structure

Compared with the 'conventional' process that includes various process steps like design, trial castings, analysis of prototypes, engine tests, and pulser tests, including the necessary optimization loops covering the whole process, the new Closed Loop CAE Procedure is much quicker and more efficient:

- Designing geometry for minimum wall thicknesses
- Strength calculation and casting simulation

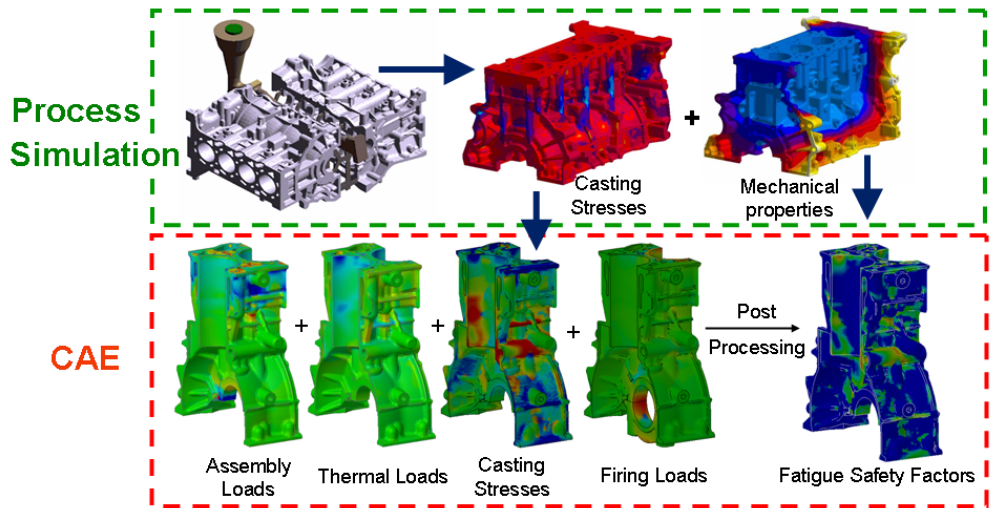


Figure 9: Integrated CAE procedure
图 9：集成 CAE 程序

- 使用适当的铸造参数，以避免冷隔
 - 在铝合金收缩过程中在一定操作温度下确保最佳的热传导
 - 确保衬套与铝合金结构之间的密封结合
- 与包括设计、试铸、原型分析、发动机测试和脉冲测试等各种工艺步骤的“传统”过程相比，包括覆盖整个过程的必要优化循环，新的闭环 CAE 程序更快、更高效：
- 最小壁厚的几何形状设计
 - 强度计算及铸造模拟
 - 通过反复计算强度、铸件性能和残余应力的优化循环
- 环
- 生产原型样件
 - 在发动机试验和脉冲发生器试验中验证设计
- 铸造模拟不仅提供了设计和工艺布局的所有相关信息（图 13），还可以使用虚拟 DOE 分析参数的相关性，从

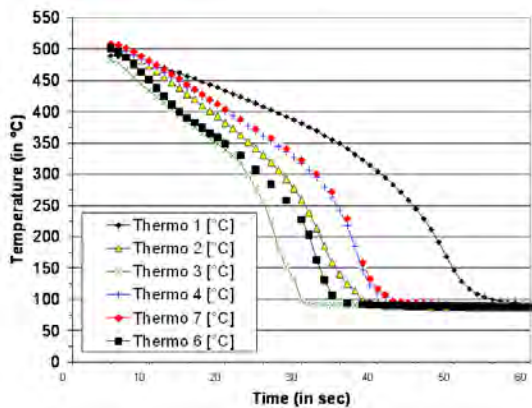
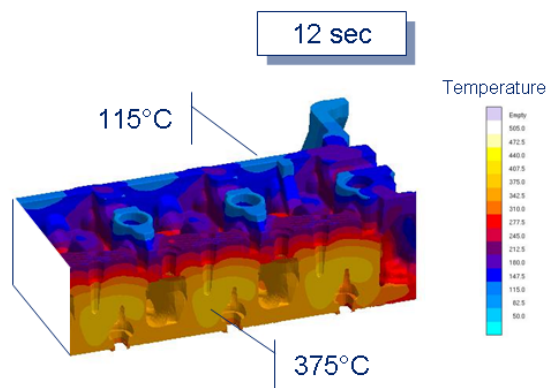


Figure 10: Cooling curves and temperatures in a cylinder head during water quench
图 10：水冷淬火，气缸盖内的冷却曲线和温度



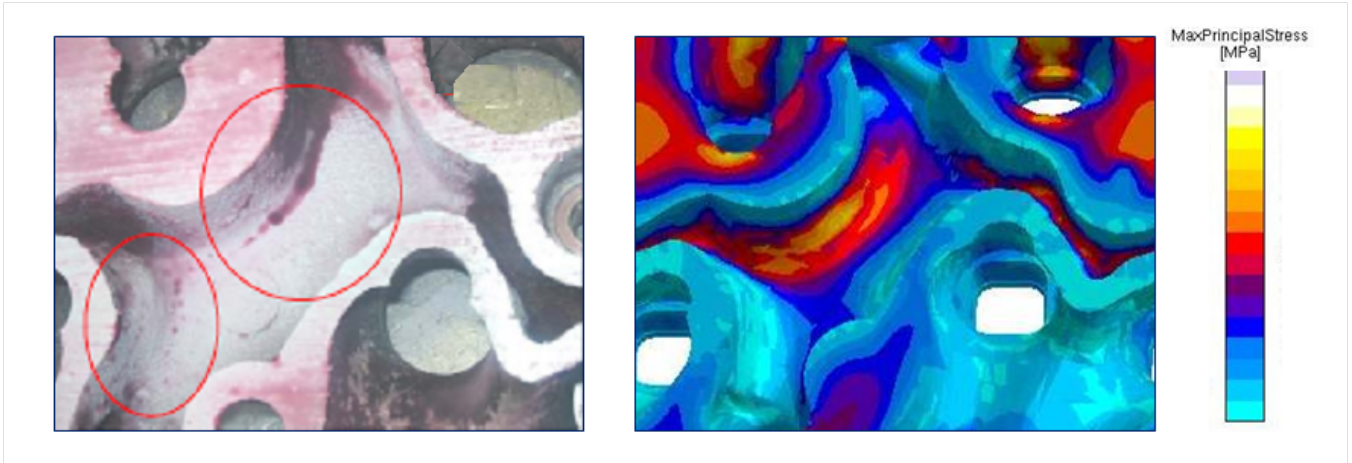


Figure 11: Test result and virtual residual stress analysis of a prototype cylinder head
图 11：原型气缸盖的试验结果及虚拟残余应力分析

- Optimization loops with repeated calculation of strength, casting properties, and residual stresses

- Producing prototype components
- Verifying design in engine trials and pulser tests

Casting simulation does not only deliver all relevant information for the layout of design and process (Fig.13); it now represents a powerful and robust feature that allows the use of a virtual DoE to analyze the interdependencies of its parameters. Not only the significantly reduced development times and costs, but also and especially the extended gained knowledge regarding component load capacity as well as process sensitivity can be seen as important advantages providing a considerably improved basis for future developments.

5. Potential for the Development Process

The previous chapter demonstrates the integrated CAE procedure as a powerful and effective tool to reduce development time and costs as well as to optimize quality. This applies to new technology concepts as well as to product development.

而确保产品的稳健性。不仅显著减少了开发时间和成本，特别是扩展了关于零件负荷能力和过程敏感性的知识，这一重要的优势，为未来的发展提供了相应改进的基础。

5. 开发过程的潜力

上一章介绍了集成的 CAE 程序作为强大和有效的工具，可以减少开发时间和成本，并优化质量。这也适用于新的技术概念和产品的开发。

在质量改进和节省成本方面的主要潜力包括：铸造试验（充型、凝固、冷隔、缩孔）、样件生产、零部件和材料分析（残余应力、性能）、包括结果评估、加工试验（硬度、裂纹），最后，同样重要的是可靠的生产参数（铸造参数、合金、嵌件温度）的定义。

5.1. 以最小的努力开发新技术

作为新技术开发的一部分，集成的 CAE 程序使高级设计阶段的概念研究具有显著的优势。过去，这应用于铸

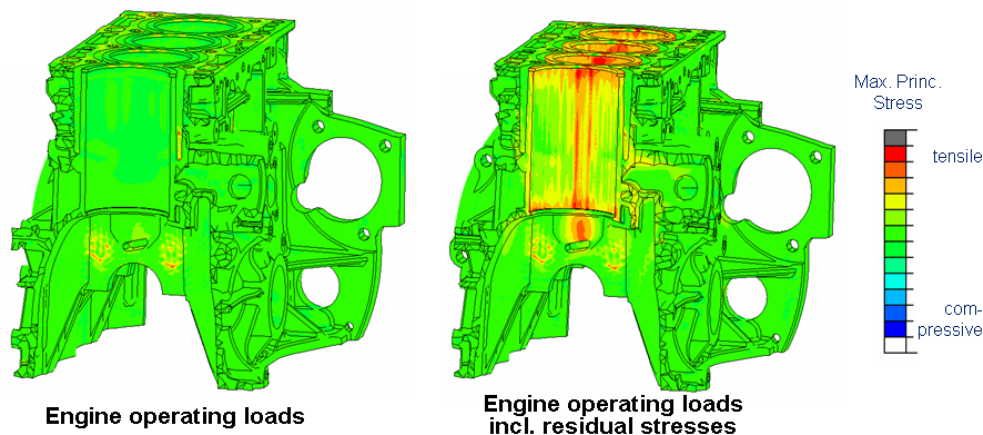


Figure 12: Impact of residual stresses on total stresses during engine operation
图 12：发动机运行过程中残余应力对总应力的影响

The main potentials for quality improvements and cost savings are: casting trials (filling, solidification, cold laps, porosities), prototype manufacturing, component and material analyses (residual stresses, properties), test runs including result evaluation, machining trials (hardness, cracks), and last but not least the definition of robust production parameters (casting parameters, alloys, insert temperatures).

5.1. Developing New Technologies With Minimum Effort

The integrated CAE procedure provides significant advantage in the advanced design phase for concept studies as part of the development of new technologies. In the past, this applied to the development of iron inserts, alternative heat treatment processes, or material substitutions. In the future, targets are more widespread topics, starting from thin wall castings via machining clamp loads and die lifetime up to alloy development.

The saving potential is explained in the complete substitution of the experimental DoE with a virtual DoE. In the advanced design phase the time for technology development can be reduced down to 50% - 25% of the normal time and costs can be reduced by up to 50 % due to omitting extensive work for sample production and machining, for tests, and for component checks.

The distinctive feature of the virtual DoE is the ability to address bigger development steps regarding design, material, and process, which is due to the fact that a much higher number of parameters can be considered including the influence of their interdependencies.

5.2. Reducing Engine Product Development Times and Costs

The first step to introduce the integrated CAE procedure into product development is the consequent parallelization of component CAE and manufacturing simulation. This measure already reduces the development time by ca.3 months, as the development of casting prototypes can be finished in time with the last design step. The increased effort for simulation and coordination during the simultaneous optimization creates additional costs; however, these costs are more than compensated by the early consideration of production related influences and the reduced effort for test bed runs. Further development focuses on the completion of material data and models for

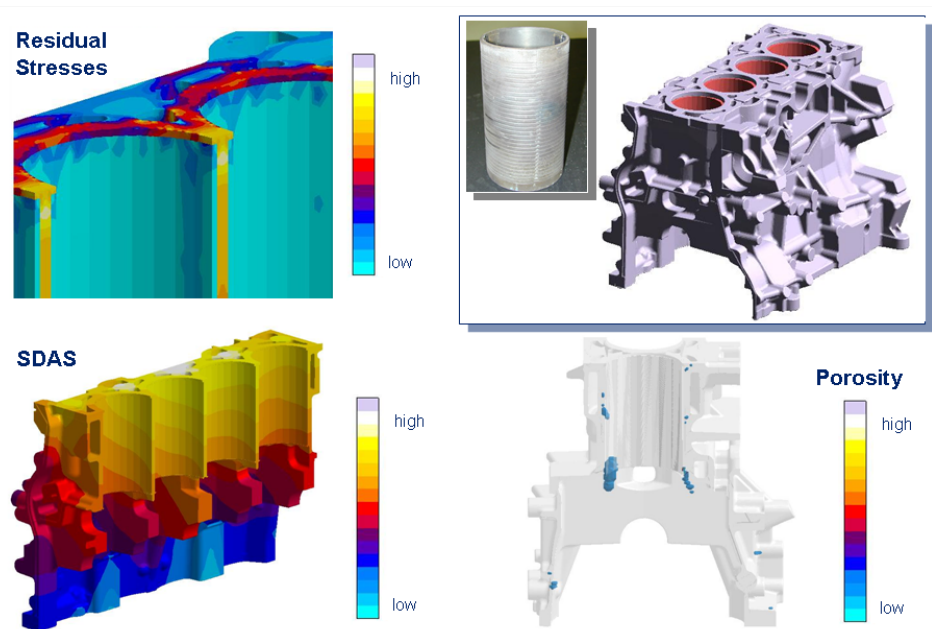


Figure 13: Casting simulation supporting new technologies
图 13：铸造模拟支持新技术

铁镶嵌件, 替代的热处理工艺, 或材料替代的发展。在未来, 目标是能应用的更广泛, 从薄壁铸件开始, 通过机加载荷和模具寿命到合金的发展。

用虚拟实验设计完全替代实际实验设计, 有效的节约了资源。在高级设计阶段, 技术开发的时间可以减少到正常时间的 50% - 25%, 成本可以减少高达 50%, 因为不用做样品的生产和加工、测试和零部件检查的工作。

由于可以考虑更多的参数, 包括它们相关性的影响, 虚拟实验设计的特点在于能够处理涵盖有关设计、材料和过程的更广的开发步骤。

5.2. 减少发动机产品的开发时间和成本

将集成的 CAE 程序引入产品开发的第一步是零部件 CAE 与制造模拟的并行化。由于铸造原型的开发与最后一步设计可以及时完成, 该措施已经减少了 3 个月的开发时间。在同步优化过程中增加的模拟和协调工作产生了额外的成本, 然而, 由于早期考虑了影响生产的因素, 并且减少实验测试, 这些成本可以得到补偿, 进一步的发展重点是对应用材料范围的材料数据和模型进行完善。

第二步是在系列 1 阶段中使用虚拟样机完全取代物理样机及其相关的实验平台 (图 14)。其结果是, 发动机开发时间减少了约 6 个月, 以及相应的成本降低, 协同效应会对包括发动机加工在内的几个工艺步骤产生影响。这里的挑战是将核心工程资源转移到 CAE 评估上。

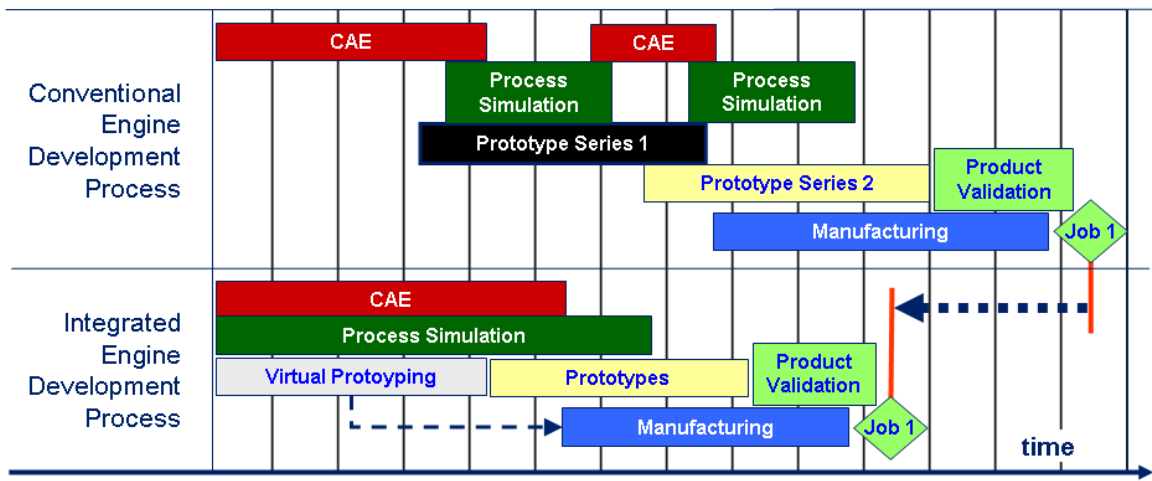


Figure 14: Savings in development time due to integrated CAE processes
图 14 : 集成的 CAE 程序节省了开发时间

the whole range of applied materials.

The second step is the total substitution of the physical prototypes and their related test bed runs with virtual prototypes in the series-1-phase (Fig.14). The result is the reduction of engine development time by approximately 6 months as well as the corresponding cost reduction with synergy effects having impacts on several process steps including engine machining. The challenge here is shifting the core engineering resources towards CAE evaluation.

6. Conclusion

The comprehensive integration of manufacturing process simulation into the engine CAE development procedure (Fig. 15) is the key to success for the accelerated realization of engine downsizing and increased performance that comes along with a reduction in development time and costs at the same time. It is the prerequisite for zero prototyping.

Our examples show the tremendous opportunities in the integrated CAE procedure, exceeding by far the savings achieved by the general and more traditional approaches. The result of this concept is like a 'breakthrough' that has rarely happened before in engine development and that will prove to be a cornerstone for all future developments. ■

6. 结论

将制造过程模拟全面集成到发动机 CAE 开发过程中 (图 15) 是成功加速实现发动机尺寸缩小和提高性能的关键, 同时也减少了开发时间和成本。这是零样件的先决条件。

我们的例子显示了在集成 CAE 程序中存在巨大的机会, 远远超过了一般和更传统的方法所节省的费用。这一概念就像一个“突破”, 这在发动机发展中是很少发生的, 这将被证明是所有未来发展的基石。■

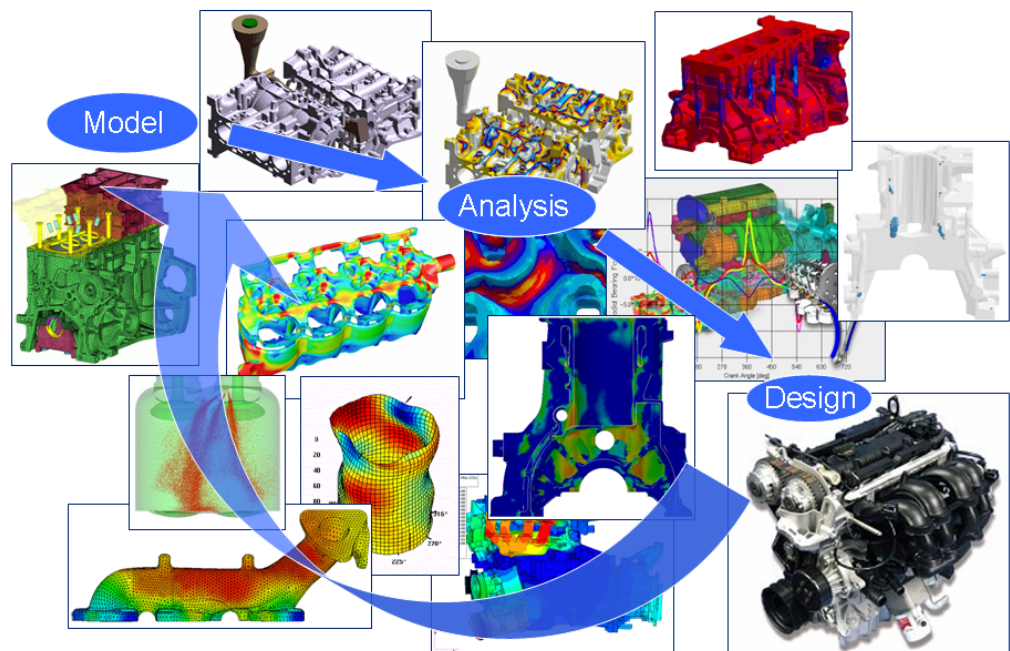


Figure 15: Integrated CAE process applied to engine development
图 15 : 集成 CAE 程序应用于发动机的开发

Product News Table of Contents

产品新闻目录

MOLD, CORE & SAND PREPARATION

造型、制芯和砂

Elkem Supports Its Customers With Solving Shrinkage Issues 45
埃肯公司助力客户解决缩松缺陷

INNOVATION

创新

Plasma Cutting for Structural Castings Instead of Stamping 47
等离子切割代替冲压生产结构铸件

DIGITALISATION

数字化

Advancing Foundry Digitalisation: Norican's Monitizer and ABP's Digital Services Agree to Interface their Products 49
推进铸造厂的数字化进程：诺瑞肯集团的 Monitizer 和 ABP 的数字化服务同意进行产品对接

Elkem Supports Its Customers With Solving Shrinkage Issues

埃肯公司助力客户解决缩松缺陷

The growth and diversity of iron casting in the Asian markets has led foundries to re-examine their inoculation processes. New iron grades demand new process solutions and end users require higher specifications.

Elkem recognizes these challenges and has a dedicated team of metallurgists and process engineers capable of supporting foundries. Backed up by extensive laboratory facilities and a R&D group, we work together with our customers to solve issues, improve processes and eliminate waste.

Traditionally, the Asian market has used calcium/barium based inoculants and these are widely available, although of hugely variable quality. However, their low potency leaves them unsuited to many applications in this challenging market, such as shrinkage control in both grey and ductile irons, producing higher strengths in thinner section light weight castings and matrix structure. All of which offer the opportunity for an examination of the inoculants available today.

In light of this, Elkem's technical experts recently consulted a foundry that manufactures ductile iron castings for critical machinery parts, weighing up to 10 tonnes. They experienced challenges with shrinkage, which resulted in rejects at a cost of \$365,000 per year as they were only detected after machining. The foundry's end user questioned the continuity in supply and quality, and thus business was at stake.

Design solutions undertaken by the foundry resulted in minor improvements, which were insufficient for the end user's situation. Trials with chills improved the shrinkage defects but unfortunately, they were not able to remove the defects to an acceptable level.

Together with the foundry staff, Elkem technicians went on-site and analysed the situation. The foundry used a 7% Mg, 1.5% TRE alloy in the treatment system, covered by steel coins. A calcium / barium inoculant was used in both the first stage and subsequent in-stream process.

Samples were sent to one of Elkem's regional research labs where expert metallurgists performed extensive analysis. As a result, they recommended changing the alloying materials.

Elkem technicians then performed a trial with LAMET™ 5922, a nodularizer containing 5.9% Mg and 0.5% La. Elkem's LAMET™ has been proven in helping to eliminate shrinkage. The cover material was changed to FeSi. ULTRASEED™ Ce inoculant was then used in-stream, because of its strong potency in reducing the irons tendency to shrink.

After the trial it was clear that the casting results

亚洲市场铸铁件需求的增长和多样性要求，导致铸造厂重新检查孕育工艺。新的铸铁等级需要新的工艺解决方案，而最终用户对技术规范的需要更高。

埃肯公司意识到这些挑战，并组建专业的冶金学和工艺工程师团队，能够支持铸造厂。在广泛的实验室设施和一个团队的支持下，我们与客户一起解决问题，改进工艺并消除废品。

传统上，亚洲市场使用以钙 / 钡基孕育剂，尽管对质量控制的变化很大，这种孕育剂仍被广泛使用。然而，因其低效，这种孕育剂在具有挑战性的市场的许多应用上并不适合，如灰铁和球墨铸铁的收缩控制，产生更高强度的薄壁轻量化铸件和复杂结构铸件。所有这些都提供了检验目前可用的孕育剂的机会。

有鉴于此，埃肯公司的技术专家最近接到一家为关键机械部件生产球墨铸铁件的铸造厂的咨询，铸件重达 10 吨。他们经历了缩松缺陷的挑战，因为缺陷只有在加工后才被发现，导致了每年 36.5 万美元的成本增加。铸造厂的最终用户质疑供应和质量的连续性，因此业务岌岌可危。

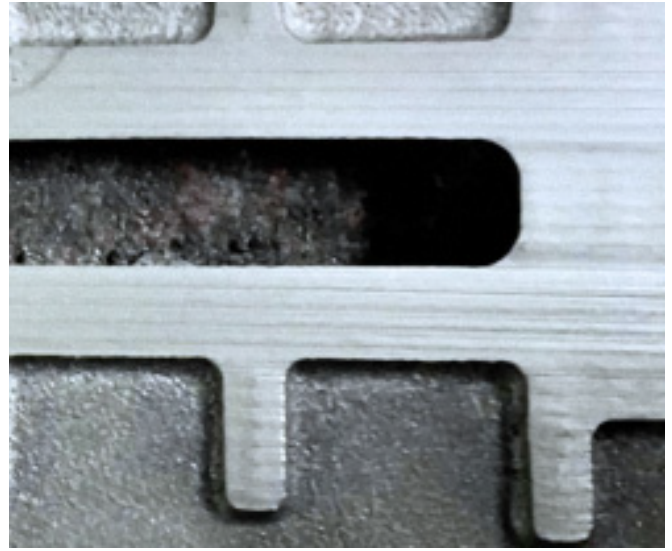
由铸造厂承担的设计解决方案起到了微小的改进，但不足以满足最终用户的要求。冷铁试验改善了收缩缺陷，但不幸的是，不能将缺陷消除到可接受的水平。

埃肯公司的技术人员与铸造厂的工作人员一起在现场分析了情况。铸造厂在处理工艺使用 7% 的镁，1.5% 的稀土合金，上面覆盖着钢硬币。钙 / 钡孕育剂在第一阶段和随后的随流孕育中都被使用。

样品被送到埃肯公司的区域研究实验室，冶金专家在那里进行了大量的分析。因此，他们建议更换孕育的合金材料。

埃肯公司的技术人员随后用 LAMET™ 5922 进行了一项试验，这是一种含有 5.9% 镁和 0.5% 镧球化剂。埃肯公司的 LAMET™ 已被证明有助于消除缩松缺陷。覆盖材料改为硅铁。然后使用 ULTRASEED™ 铈孕育剂随流孕育，因为其具有较强的效力，可以降低铸铁收缩的趋势。

试验后，很明显，随着缩松孔隙的消除，铸件质量显著改善。



Casting results before and after the modified alloy additions
改变孕育合金前后的铸件

improved significantly with shrinkage porosity eliminated.

Introducing LAMET™ 5922, ULTRASEED™ Ce, and FeSi to the process resulted in major improvements:

The scrap rate dropped from 30 % to 2 %. There was also a very low shrinkage level, accepted by the end user, and there was no need for the use of chills or any other production process change.

Not only was the foundry able to save annual costs immensely by reducing the scrap rate, but the foundry's customers' satisfaction also improved resulting in a continuation of the business.

For more information on new inoculation technologies, please contact your local Elkem representative or visit our website www.elkem.com/foundry.

Join us at Metal China 2023, 8-11 May, Hall S14, Stand B03. We are looking forward to welcoming you and talking about the best solutions for your foundry! ■

引入 LAMET™ 5922 球化剂、ULTRASEED™ 钕孕育剂，覆盖硅铁的工艺方案取得重大改进：废品率从 30 % 下降到了 2%。缩松缺陷下降到极低的程度，获得最终用户的认可，并且不需要使用冷铁或任何其他生产工艺的改变。

铸造厂不仅能够通过降低废品率来极大地节省年度成本，而且客户的满意度也有所提高，从而使业务得以继续。

有关更多新的孕育技术的信息，请联系当地埃肯公司的代表或访问我们的网站 www.elkem.com/foundry。

2023 年 5 月 8-11 日，诚邀您来到中国国际铸造博览会 S14 号馆 B03 展位。我们期待您的莅临，并为您的铸造工艺讨论最佳的解决方案! ■

Plasma Cutting for Structural Castings Instead of Stamping

等离子切割代替冲压生产结构铸件

SIR's solution adapts to changes in production processes in the automotive industry and the growing need for alternative machining operations

The need for innovation

With the rise of electric cars in the automotive sector, manufacturers have been investing for years in design and production processes that help further reduce the mass of their vehicles, which is often compromised by the weight of the batteries that power them.

An obvious candidate for significant weight reduction is the chassis, the skeleton that forms the main structure of the vehicle. In the automotive industry, the chassis traditionally consists of a series of castings that are then assembled in various processes to form a complete chassis. This requires a long chain of different components, a long list of suppliers and a complex assembly line with high production and maintenance costs.

One-piece half frames and the need for alternative processes

The latest and most recent innovation in this field goes in a completely different direction from these traditional processes. The introduction of aluminum die-casting of frames, not only for small components that then have to be assembled, but directly as whole half-frames with larger dimensions, is a goal that was previously considered difficult to achieve. This eliminates much of the assembly production process described above, which significantly lowers costs and reduces the need for special machinery.

Plasma cutting instead of stamping

Another important detail that emerges because of this innovative process concerns the removal of sprues during the machining phase of the frame. In the conventional method, the sprues are separated from the main body of the part by punching. This was possible and cost-effective due to the small size of the frame parts, which do not require over-complicated or oversized punching machines. Die-casting whole frames, on the other hand, logically results in a casting whose channels extend over a larger area, making the stamping process more expensive and less flexible.

Flexibility and cutting quality: one partnership and one solution

SIR (Soluzioni Industriali Robotizzate), long a leader in building robotic cells for various sectors and with a strong presence in the automotive industry, and HYPERTERM, a global manufacturer of plasma generators, have entered into a

SIR 的解决方案适应汽车工业生产流程的变化以及对替代机加工操作日益增长的需求。

创新需求

随着电动汽车在汽车行业的兴起，多年来，制造商一直在投入设计和生产流程的研发，以帮助进一步减轻汽车的重量，而汽车的重量往往会受到为其提供动力的电池重量的影响。

能够极大减轻重量的重点方向是底盘，即构成车辆主要结构的骨架。在汽车行业，底盘由一系列铸件组成，然后通过各种工艺进行组装，形成一个完整的底盘。这需要很长的由不同部件组成的产业链来完成、涉及到很多供应商和一条复杂的生产和维护成本高的装配线。

一体化结构件对替代工艺的需求

在这方面，最先进和最新创新方向朝着与传统工艺完全不同的方向发展。引入铝压铸结构件，不仅代替了必须组装的小部件，而且直接作为更大尺寸的半框架结构，这在以前被认为是难以实现的目标。一体化压铸无需上述大部分的组装生产过程，因此显著降低了成本并减少了对特殊机械设备的需求。

等离子切割代替冲压

由于创新工艺的出现，涉及到的另一个重要环节是框架结构件机加工前去除浇口。在传统工艺中，浇口通过冲压与零件主体分离。因为框架部件的尺寸很小，不需要过于复杂或超大的冲压机，这在以前是可行且具有成本效益的；但是，从逻辑上看，整个框架的压铸会导致铸件的通道延伸到更大的区域，从而导致冲压的费用更昂贵、更不灵活。

灵活性和切割质量：合作伙伴和解决方案

SIR (Soluzioni Industriali Robotizzate) 公司一直是为各行业提供机器人电池的领导者，在汽车行业有着强大的影响力。SIR 公司与全球等离子体发生器制造商 HYPERTERM 公司已达成合作，通过机器人焊炬优化等离子体切割应用。等离子切割已被证明是在单件铸件中去除浇口的最具成本效益和效率的冲压替代方案，

collaboration to optimize plasma cutting applications with robotic torches. Plasma cutting has proven to be the most cost-effective and efficient alternative to punching for removing sprues in one-piece castings, offering convenience, cost savings, flexibility, and ease of use. Features that are due to the innate characteristics of the robots, which offer the ability to adapt to different types of cuts on different components, thus offering cost savings; and to the characteristics of the plasma torch, which guarantees lower consumption and costs than the alternatives, while allowing clean cuts, i.e. requiring fewer finishing steps in the following stages.

In the event of a batch change, there is no longer any need to replace costly and cumbersome punching tools; all that is required is a simple reprogramming of the robot paths in conjunction with a possible adjustment of the reference support and the support of the workpiece. The two companies are therefore working together to optimize these applications to support the cutting of sprues of different thicknesses, adjust cutting speeds and achieve an ever higher level of quality. One example is the application recently developed by SIR for a major automotive customer. The application takes the form of a robotic cell and aims to dematerialize aluminum castings, in particular front and rear half-frames, using a plasma torch. The cell consists of handling robots that operate cutting cells where other robots in booths cut and remove sprues and runners.

The system is complemented by manual deburring cells, which will also be robotized in the future. The main focus of the application, as already mentioned, is the use of technologies that enable clean cuts with much greater flexibility than conventional cutting solutions. The result is a cell whose robots guarantee a high degree of adaptability to the machining of parts of different sizes and shapes, characterized by high machining quality and very high efficiency, offering a solution for customers who are evaluating this new frame casting process with growing interest. ■

提供了便利、灵活性和易用性，节约了成本。机器人的固有特性提供了适应不同部件的切割能力，从而节省了成本；由于等离子体炬的特性，能够进一步降低消耗和成本，同时可以进行精简切割，即在之后的操作步骤需要较少的精加工处理。

在批量更换的情况下，不再需要更换昂贵而笨重的冲压工具；所需要的只是结合参考支撑件和工件支撑件的可能调整来对机器人路径进行简单的重新编程。因此，这两家公司正在通过合作优化这些应用程序，以支持不同厚度的浇口切割、调整切割速度、获得更高的质量。一个例子是，SIR 公司最近为一个主要的汽车客户开发了应用程序。该应用程序采用机器人单元的形式，旨在使用等离子体炬对铝铸件，特别是前半框架和后半框架进行材料减量处理。机器人单元由操作切割的工业机器人组成，其他机器人在工位上切割和移除浇口和浇道。

该系统还包括手动去毛刺单元，该单元也将在未来实现机器人化。如前所述，该应用的重点是使用比传统切割解决方案具有更大灵活性的精益切割技术。该单元的机器人能够保证加工不同尺寸和形状的零件具有高度的适应性，其特点是具有更高的加工质量和生产效率，增强了正在对这种新的结构件铸造工艺进行评估的客户的兴趣。 ■



Advancing Foundry Digitalisation: Norican's Monitizer and ABP's Digital Services Agree to Interface their Products

推进铸造厂的数字化进程：诺瑞肯集团的 Monitizer 和 ABP 的数字化服务同意进行产品对接

Monitizer, part of Norican Group (DISA, Simpson Technologies, Wheelabrator, StrikoWestofen and ItalPressGauss), and ABP Induction Systems have agreed to build links between their digital systems.

The two foundry suppliers will now collaborate to create an interface that will share furnace data from ABP Digital Services with the Monitizer® Suite from Norican.

Monitizer is a modular, equipment- and brand agnostic IIoT platform for the foundry industry. Monitizer | DISCOVER collects, aggregates and displays data from multiple equipment, lines or global sites, with user-friendly reporting and visualisation tools that help unlock serious process improvements - fast. Monitizer | PRESCRIBE harnesses the power of AI to optimise an entire foundry process and is proven to drive average scrap reductions of 40%.

"I am delighted to announce that we will work with ABP to support data transfers between our systems," says Nina Dybdal Rasmussen, who heads up the Monitizer brand at Norican. "The more data our customers can extract, the greater the potential for improvement - which is why we built Monitizer as an IIoT system capable of connecting all parts of the line. ABP enables a vital part of the foundry process and integrating data from their equipment will be a huge benefit for our joint customers."

Till Schreiter, President and CEO of ABP Induction Systems: "Foundries need to be able to bring their data together in one place and everyone will benefit from this practical, constructive agreement."

Nina Dybdal Rasmussen, Head of Monitizer: "ABP enables a vital part of the foundry process and integrating data from their equipment into Monitizer will be a huge benefit for our joint customers."

ABP's portal "myABP.com" is the gateway into digitalisation. It provides foundry equipment documentation plus specialised hardware and software which support intelligent management of equipment and skills while enhancing communication between foundry personnel. It also offers virtual emotional learning environments and digital twins, as well as a fully

Monitizer 和 ABP 感应系统已同意在其数字化系统之间构建连接。这两家铸造供应商现在将合作打造一个接口，用于与 Monitizer®Suite 共享来自 ABP 数字化服务的工业炉数据。

这两家铸造行业供应商，将强强联合，打造出可以同时共享感应炉数据给 ABP 数字服务和诺瑞科 Monitizer 数字化解决方案的交互系统。

Monitizer 是一个与设备和品牌无关的模块化 IIoT 平台，适用于铸造业。Monitizer|DISCOVER 收集、汇总和显示来自多个设备、生产线或全球站点的数据，并提供用户友好的报告和可视化工具，这些工具可以帮助铸造厂快速实现重大工艺改进。Monitizer|PRESCRIBE 利用人工智能的力量来优化整个铸造工艺，实践证明，平均废品率降低了 40%。

"我很高兴地宣布，我们将与 ABP 合作，支持在我们的系统之间实现数据传输，" Monitizer 品牌负责人 Nina Dybdal Rasmussen 说。

"我们的客户提取的数据越多，实现改进的潜力就越大——因此，我们把 Monitizer 构建成了一个能够连接生产线所有部分的 IIoT 系统。ABP 实现了铸造工艺的关键部分，整合来自其设备的数据将为我们的共同客户带来巨大的好处。"

"铸造厂需要能够将他们的数据汇集到一个地方，每个人都将从这个实用的建设性协议中受益。" ABP Induction Systems 总裁兼首席执行官 Till Schreiter 说。

"ABP 实现了铸造工艺的关键环节，整合来自其设备的数据将为我们的共同客户带来巨大的好处。" Monitizer 负责人 Nina Dybdal Rasmussen 说。

ABP 的门户网站 "myABP.com" 是通向数字化的途径。该网站提供所有相关的铸造设备文件、专用硬件和



automated service application that includes a ticketing application and a 24/7 spare parts web store.

“Foundries need to be able to bring their data together in one place and everyone will benefit from this practical, constructive agreement,” says Till Schreiter, President and CEO of ABP Induction Systems. “ABP and Norican are both highly motivated to help digitalise the foundry industry and linkages like this between different suppliers are vital to support completely connected digital eco-systems. Without them, it will be impossible for foundries to extract the full value from their data.”

For more information:

<https://monitizerdigital.com>

<https://abpinduction.com/en/digitalsolutions/myabp-portal/> ■

软件，以提高铸造厂设备的智能化水平、改善铸造厂人员的技能管理和沟通、增强虚拟情感学习环境和数字双胞胎以及提供全自动的服务应用，包括全天候开放的备件网店和票务应用。

“铸造厂需要能够将他们的数据汇集到一个地方，每个人都将从这个实用的建设性协议中受益。” ABP Induction Systems 总裁兼首席执行官 Till Schreiter 说。

“ABP 和诺瑞肯都非常积极地帮助铸造行业实现数字化，而不同供应商之间的这种链接对于支持完全互联的数字化生态系统至关重要。没有这种链接，铸造厂就不可能从他们的数据中提取全部价值。”

了解公司更多详情，请访问：

<https://monitizerdigital.com>

<https://abpinduction.com/en/digitalsolutions/myabp-portal/> ■

Industrial Coordination New Platform, New Growth

230,000 m²

2300
exhibitors

200
activities

300,000
visitors



22届铸博会
METAL CHINA



17届压铸展
DIECASTING
CHINA

2024.7.4-7.7 | NECC, SHANGHAI

铸造

Foundry

锻压

Metalforming

热处理

Heat treatment

表面处理

Surface finishing

焊接

Welding





明志科技
Mingzhi Technology

**CORE
EQUIPMENT
AND CORE SERVICES
AT A COST SAVINGS
FOR A CHANGE**

Mingzhi Technology Leipzig – our technical and production center where turn-key core equipment solutions & core production services are developed to meet “smart” production requirements.

With decades of experience, we identify technologies to improve the performance of our complete line-up of core machines for all processes.



**Discover
the savings
strategies &
services for
high-precision cores**

by **Mingzhi Technology Leipzig**

MiCoreCentre® MiCoreControl®

Precision Core Package Technology (PCP)

Whereby a single core machine produces both the core mold & cores to be assembled. PCP takes complexity & waste out of coremaking while meeting the requirements of high precision and complex castings.

MiCC Integrated core centers

Our smart core centers consolidate the core making steps and use patented micl intelligent controls to save space, time, cost and the environment. Available in the core machine size you need.

Inorganic and Cold-box Technology

The inorganic process cleans up the coremaking procedure. Yielding high strength cores, while saving energy, waste and emissions.

Core Production Services

Producing inorganic cores in-house on behalf of clients using our vast experience and saving you the effort.

VISIT US IN HALL 15E01

MINGZHI TECHNOLOGY LEIPZIG GMBH
AM GLÄSCHEN 7, 04420 MARKRANSTÄDT
T. 034205 8934-20
INFO.LEIPZIG@MINGZHI-TECH.EU

