

[Cover Story] The 10th Anniversary of the Belt and Road Initiative: jointly build a Silk Road community beyond the horizon

[Industry Insights] How to make steel bridges by following high quality requirements?

[Interview] How was the domestic largest capacity offshore wind power installation vessel built?



jointly build a Silk Road community beyond the horizon

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SHANGHAI ZHENHUA HEAVY INDUSTRIES CO., LTD.

ZPMC 振华重工



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总第50期

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主管、主办：上海振华重工（集团）股份有限公司

振华重工

SHANGHAI ZHENHUA HEAVY INDUSTRIES CO., LTD.

跨越山海 共建丝路



- 【封面故事】“一带一路”十周年：跨越山海 共建丝路
- 【行业观察】高质量发展要求下，钢桥建造如何发力？
- 【高端访谈】国内起重能力最大海上风电安装平台是怎样“炼”成的？

2023年第5期

丝路兴,天下通,前路风光正好!

文 / 薛韦慧

悠悠驼铃回荡于绵延千里的黄沙，惊涛骇浪挡不住浩浩荡荡的船队。古老神秘的丝绸之路，连通着华夏与西域，是东西方商品贸易、文化交流的桥梁。

2013年，中国提出共建“一带一路”倡议，借鉴古丝绸之路，加强政策沟通、设施联通、贸易畅通、资金融通、民心相通，为世界经济增长注入新动能，为全球发展开辟新空间，为国际经济合作打造新平台。

十年耕耘结硕果。漫漫丝路，中国已与150多个国家和30多个国际组织签署了200多份共建“一带一路”合作文件，达成3000多个合作项目。展望未来，“一带一路”将继续发挥重要作用，促进相关国家和地区经济繁荣、文化交融。2023年10月17日至18日，第三届“一带一路”国际合作高峰论坛在北京举行，标志着推动共建“一带一路”进入高质量发展的新阶段。

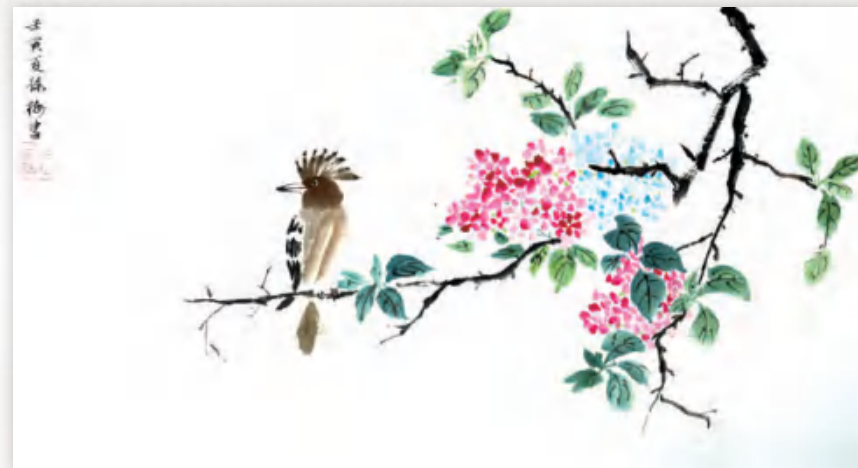
于振华重工，投身建设“一带一路”伟大事业，既是弥足珍贵的发展机遇，也是义不容辞的历史责任。作为世界知名的重型装备制造企业，振华重工布局海外多年，与世界各国用户在合作中彼此成就。

振华重工尊重所在国的商业道德和贸易准则，致力于把“一带一路”建设成“和平之路”，用重型装备搭建“和平之桥”；致力于把“一带一路”建设成为“繁荣之路”，以设备联通全球港口，以港口释放各国发展潜力，实现经济大融合、发展大联动、成果大共享；致力于把“一带一路”建设成为“开放之路”，推出联通全球港口的数字化智能平台，为全球用户提供后市场服务，携手构建广泛的利益共同体；致力于把“一带一路”建设成为“绿色之路”，不断研发绿色、低碳港口设备，将绿色环保的设计理念融入设备建造，开拓可持续的港口运营模式；致力于把“一带一路”建设成为“创新之路”，以大数据、云计算等技术，持续推动制造业数字化智能化转型升级，推进智慧港口码头建设；致力于把“一带一路”建设成为“文明之路”，在拓展海外市场的同时，开设汉语培训班、搭建校企共建平台、践行海外社会公益、加强文化交流。

从历史走到今天，记录东西方交融合作的丝绸之路，栉风沐雨，历久弥新。而今，在共建“一带一路”的新征程中，振华重工将继续用中国装备架起友谊之桥，为高质量共建“一带一路”注入振华力量。



《金秋赏桂》
作者：李亭杉



《戴胜》
作者：徐梅





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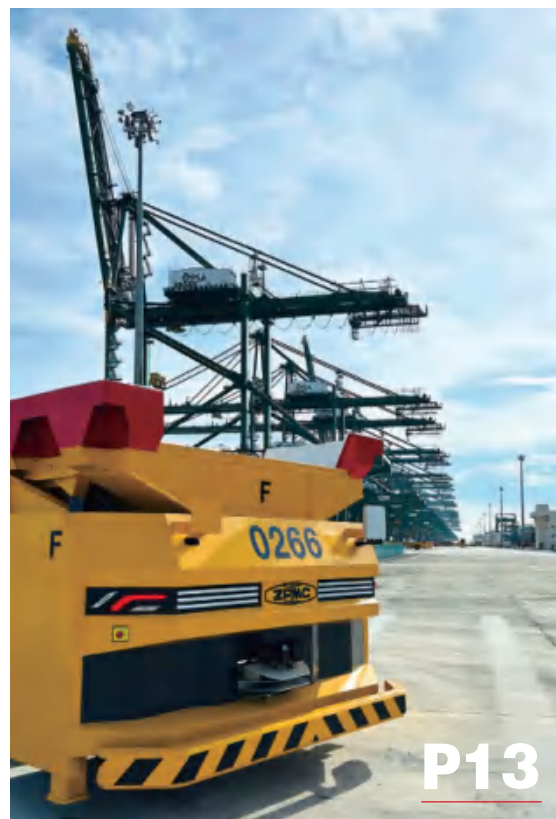
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振华重工

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“一带一路”十周年： 跨越山海 共建丝路

文 / 陆怡艳

丝绸之路绵延千里，横贯欧亚，承载着两千余年的厚重历史和东西方和平共荣的美好愿望。2013年，习近平总书记提出共建“一带一路”倡议。10年来，理念化为现实，在世界版图上，两条始自中国的交通大动脉壮阔而恢弘，让古丝绸之路重现于世界视野。10年来，振华重工勇当“一带一路”倡议合作共赢的先行者、坚定的践行者，紧紧抓住历史机遇，沿着古老的丝绸之路，为“一带一路”沿线国家贡献 ZPMC 智慧和方案。

迎风出海 抢抓海外市场

从 1992 年的海外第一单,历经 30 余年的发展,振华重工成长为重型装备制造领域“全球贸易之臂”,产品进入 107 个国家和地区,海外业务贡献占比超过 50%,为“一带一路”沿线 78 个国家提供设备。

科技创新是振华重工“迎风出海”的压舱石。振华重工在港口机械制造领域坚持自主创新,推出 3E PLUS 级超大型岸桥、双四十英尺双小车岸桥、节能型轮胎吊、自动化轨道吊、桥式抓斗卸船机、自动驾驶无人跨运车等一系列产品,引领集装箱港口机械的发展,促进行业跨越式发展,推动产业结构升级。

差异化是打造品牌的有效方式。振华重工面对不同客户,因地制宜提供定制化设备,满足个性化需求。2014 年,振华重工为地震多发的秘鲁用户研制出超巴拿马型抗震岸桥,在岸桥上增加了先进的隔震装置,既能抵抗地震,又有效控制整体重量;基于缅甸仰光港基建改造时间久、承载能力弱等特点,振华重工将“轻型”设计理念贯穿始末,研制出 3000 型岸桥,整机重量小于 500 吨,作业效率较常规机型提高约 21%,精准响应用户需求。

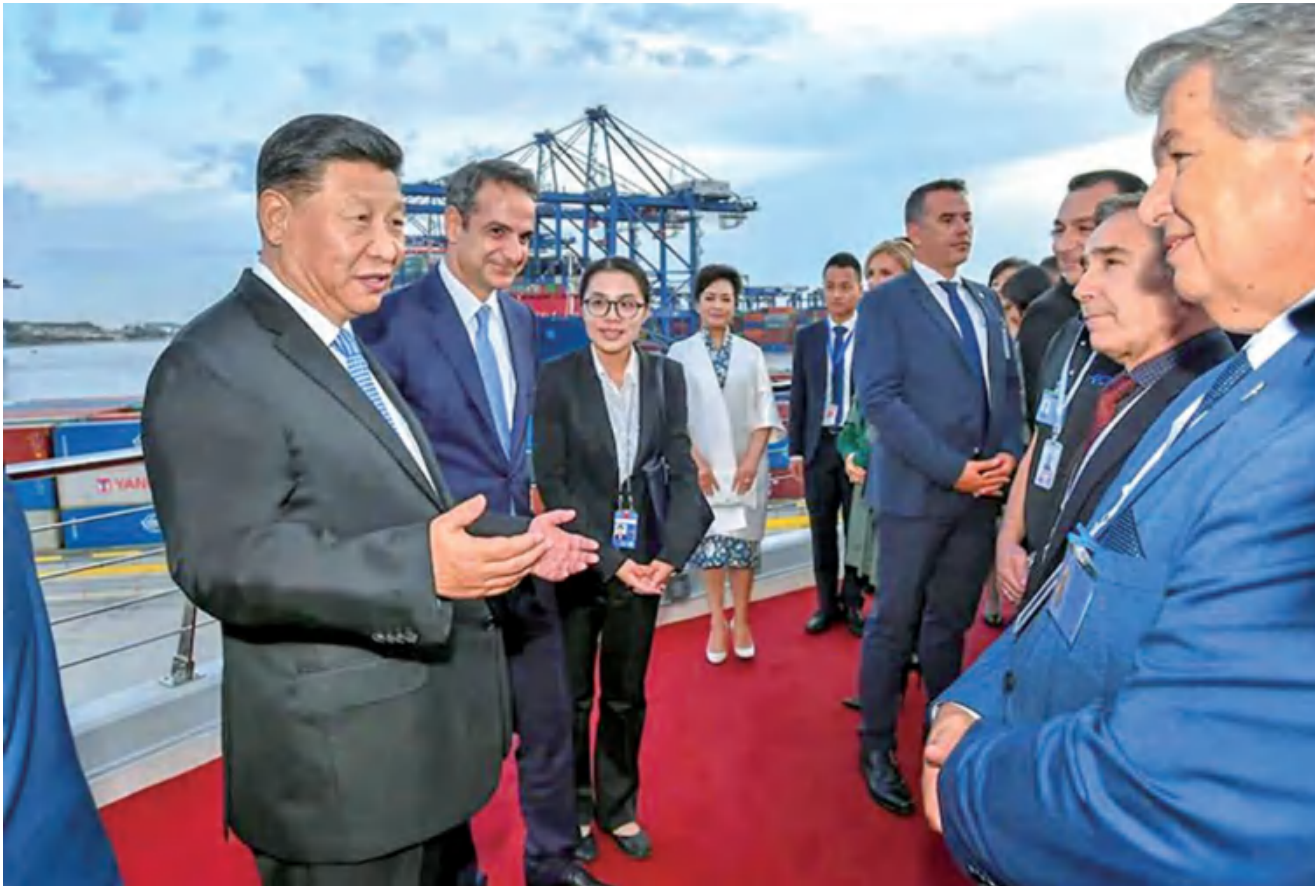
与此同时,振华重工深耕自动化码头建设领域,参建了新加坡大士港、阿布扎比哈里发港、意大利瓦多港、泰国蓝菜帮港、以色列海法新港等多个“一带一路”沿线国家港口的自动化码头项目,实现了从单



阿布扎比哈里发港



意大利瓦多港



习近平主席和希腊总理米佐塔基斯共同参观中远海运比雷埃夫斯港项目

机设备供应商向系统集成总承包商转变,从传统的港口机械制造商向现代化智能化码头整体解决方案提供商转变。

桥梁建设也是振华重工参建“一带一路”工程中浓墨重彩的一笔。振华重工积极引进专业化桥梁制造设备,有效提高制造效率。同时,率先将智能制造 BIM 技术引入钢桥制造中,参建了莫桑比克马普托大桥、克罗地亚佩列沙茨大桥等一批结构新颖、技术复杂、设计和施工难度大、科技含量高的桥梁项目,为振华重工迈向桥梁制造一流企业打下坚实基础。公司凭借这些备受瞩目的项目,为“一带一路”沿线国家贡献了中国方案、中国标准和中国力量。

振华重工的产品跨越海洋,走向“一带一路”沿线国家,离不开振华重工远洋运输船队。目前,公司拥

有约 20 艘远洋重大特运输船,不仅能够高效、安全、稳妥地将公司港口机械、大型钢结构等产品运向世界各港口,确保准时交货,还逐步走向外部高端半潜运输市场,业务范围遍布全球,拥有稳定优质客户群。

合作共赢 各国政要点赞

多年来,振华重工共建“一带一路”的“朋友圈”越来越大,共商、共建、共享的和平发展理念也获得广泛认同,诸多国家政要都曾为振华重工参建的项目点赞。

打开“一带一路”欧洲朋友圈,有一条重磅“点赞”信息。2019 年 11 月,正在希腊进行国事访问的习近平主席在希腊总理米佐塔基斯的陪同下,参观了中希

两国共建“一带一路”的龙头示范项目——比雷埃夫斯港。习近平主席说:“百闻不如一见,今天来到比港亲眼看到了这里的发展变化,中国倡议的‘一带一路’不是口号和传说,而是成功的实践和精彩的现实,‘一带一路’倡议坚持共商共建共享不是一家说了算,而是大家共担责任、共享成果。”温暖坚定的话语赢得热烈掌声。

在振华重工参建的欧洲第五大桥梁工程——克罗地亚佩列沙茨大桥项目建设期间,克罗地亚总理安德烈·普连科维奇多次视察施工现场,并赞扬中国建设者以勇克时艰的无畏精神,让全世界见证了中国速度,彰显了中国力量。

来到“一带一路”亚洲朋友圈,肯定和点赞也频频出现。2015 年新加坡 PSA 港务局三期码头开港时,总理李显龙在远控室亲自操作了振华重工制造的岸桥,并对岸桥效率、可靠性表示了肯定。同年,远在几千公里外的卡塔尔,时任首相阿卜杜拉出席了振华重工港机设备到岸欢迎仪式。2022 年 5 月,时任东帝汶总理鲁瓦克携政府官员出席该国史上最大的港机设备到港仪式,该设备由振华重工制造。此外,时任韩国总统朴槿惠与海洋署官员一行在考察仁川鲜光码头时,也对振华重工提供的安全、高效、无污染的港机设备表达了由衷赞赏。

在“一带一路”非洲朋友圈,也留下了众多当地政要见证和点赞的足迹。沿着时间线回溯,我们看到,2023 年 8 月,科特迪瓦总统阿拉萨内·瓦塔拉、副总统蒂耶莫科·梅里埃·科内、总理帕特里克·阿希等科方政要出席振华重工参建的阿拉萨内·瓦塔拉大桥通车仪式;2022 年 12 月,肯尼亚交通部长穆尔科门出席奈瓦沙 ICD 车站振华重工轨道吊交付仪式;2022 年 7 月,时任尼日利亚总统布哈里发表申明,对首个现代化深水港莱基港迎来振华重工首船设备表示祝贺;2018 年 11 月,莫桑比克总统纽西携夫人及政府官员出席莫桑比克马普托大桥通车仪式,该桥是振华重工参建的非洲第一大悬索桥;2016 年 2 月,时任几内亚

总统孔戴率多名政府官员赴科纳克里自治港出席振华重工 2 台岸桥揭幕仪式。

跨越太平洋,走进“一带一路”北美洲朋友圈,也同样能看到振华重工的身影。2018 年 12 月,振华重工参加了 2018 中国(巴拿马)综合品牌展览会,时任巴拿马总统巴雷拉亲临展会并在港珠澳大桥、洋山四期自动化码头等模型前驻足,了解项目整体情况。

振华重工共建“一带一路”硕果累累,为沿线各国经济发展和民生改善“插上翅膀”,而各国政要的关注和点赞也为振华重工继续高质量共建“一带一路”注入动力。



克罗地亚总理安德烈·普连科维奇多次到佩列沙茨大桥项目现场考察



时任巴拿马总统巴雷拉关注 ZPMC 参建的自动化码头项目

融合互通 深化属地经营

振华重工自成立以来就积极拓展海外市场,随着海外市场规模不断壮大,业务领域不断拓展,海外经营工作进入精细化管理、属地化经营的新阶段。

2022 年,振华重工加快推进国际化进程,将全球市场划分为拉美、北美、亚洲、印澳、中东、非洲、俄罗斯和欧洲八个区域,并分别设置海外区域中心。海外区域中心服务范围覆盖 25 个国家 36 个城市,承担开拓市场、备件销售、维保等职责,让振华重工在海外尤其是在“一带一路”沿线国家的发展战略更加清晰,经营体系更加完善,公司治理更加规范,为振华重工属地化



2019 年, 振华重工拉美子公司与巴拿马科技大学正式签署合作协议



振华重工斯里兰卡合资公司举行十周年庆祝仪式

经营注入强劲动力。

持续提升海外服务质量和用户满意度,是提升海外经营水平的关键。为此,振华重工努力培养专业水平过硬、区域化多国派遣、文化融合度高的属地化人才队伍。东南亚、斯里兰卡合资公司、拉美子公司等属地员工均达 90% 以上,他们参与当地项目的管理和施工,为振华重工服务全球提供人才支撑。2022 年 3 月,振华重工立足印澳区域,发挥自身优势,成立首个海外人才中心。经过一年多的发展,从最初的印度子公司本地 50 余人团队,发展至包含印度、斯里兰卡、澳洲共计近 300 人的团队,成为一支有强大凝聚力和战斗力的海外专业人才队伍。目前,海外人才中心有包含电气、机械、软件、销售等职能的工程师 101 名,以及包含电焊工、冷作工、起重工、钳工等工种的技术工人 193 人。同时还储备大量项目管理、财务税务法律、企业运营管理、市场营销等专业人才,并设有培训工程师,致力于技术工人培训,强化后备人才梯队建设。

海外人才中心成立以来除了完成印度当地十余个项目的售后服务工作,还助力东帝汶项目 2 台岸桥 4 台轮胎吊及巴布亚新几内亚项目 2 台岸桥的卸船和交付以及其他诸多项目。海外人才中心团队坚持“以用户为中心”的理念,巩固与用户的长期合作关系,从提供设备到设备升级改造有偿服务,再到设备维护保养,努力让 ZPMC 品牌成为用户的“首选”。

为了打造属地化服务网络,更好地为用户提供备件和服务,从根本上解决码头备件采购、周期长的难题,2017 年,振华重工成立子公司 Terminexus,专注港机及大型装备的备件服务。Terminexus 依托振华重工的全球化网络,提供属地化服务,打造了以码头业务为核心的一体化电商平台、可视化库存分析平台和智能数据分析系统,利用全球港机存量市场的数据优势,整合与优化供应链体系,帮助码头用户降本增效。目前, Terminexus 港机数字化供应链业务已与全球 326 个港口码头企业开展合作,助推振华重工一站式服务质效提档升级。

丝路情缘 同唱友谊赞歌

“振华重工是一家有责、有爱的企业,他们用实际行动证明了企业的担当,传播了正能量。这个项目会成为助推中巴友谊的又一座桥梁。”今年 8 月,在振华重工为巴拿马儿童福利院捐赠光伏电站的竣工剪彩仪式上,当地国际公益组织负责人如是说。

相知无远近,万里尚为邻。重走丝路,振华人在抓住海外发展机遇、积极投身“一带一路”建设的同时,深入践行“以人为本”理念,以海外项目和属地机构为桥梁,积极履行社会责任、促进多元文化交流,在“一带一路”沿线国家谱写一曲又一曲中外友谊赞歌。

除了为巴拿马儿童福利院捐赠光伏电站外,今年,振华重工印澳区域中心斯里兰卡子公司也举办了主题为“小书包、大爱心,庆贺兰卡新年、共建一带一路”的公众开放日活动。活动现场,斯里兰卡子公司负责人为员工子女赠送了爱心书包,同时向他们传播了中国文化。孩子们纷纷表示想去中国和长大后进入中国企业工作的愿望。振华重工通过一项项暖心工程在孩子们心中播撒了中外友谊的种子。

此外,振华重工以海外项目为抓手,在助力当地经济社会发展的同时,也为有志青年搭建施展才能和实现抱负的舞台。

帕米卡是斯里兰卡合资公司的属地员工,2014 年毕业后就加入到 ZPMC 的大家庭中。在中国师父张志勇的带教下,帕米卡迅速成长为一名出色的电气工程师,从斯里兰卡到巴基斯坦,师徒俩凭借过硬的技术解决一个又一个技术难题,他也因此荣获“2018-2019 年度中交集团十佳外籍青年员工”荣誉。

达特菲尔是振华重工在莫桑比克马普托大桥建设时招募的一名当地工人。经过项目部几个月的悉心教导,他从一名学徒工成长为技术过硬的属地班组带班人。马普托大桥建成后,如达特菲尔一般在大桥建设期间培养出的 5000 余名本地技术工人融入当地各产业中,带动更多人用双手创造幸福美好的生活。



第二十二届“汉语桥”世界大学生中文比赛南非赛区决赛暨“振华重工杯·汉语桥”南非大学生中文比赛



振华重工德国子公司向德国汉华中文学校捐赠图书

2023 年,振华重工为沙特吉达港提供了 10 台岸桥,多位当地女性应聘成为自动化岸桥的远程控制司机。自动化岸桥带来的不仅是工作环境的改善、工作效率的提高,更是工作观念的升级和思想的解放,“女性不适合操作岸桥”的传统印象正在逐渐被打破。振华重工在与沙特吉达港、达曼港的合作中,为提升当地女性就业、实现自我价值贡献出振华智慧。

作为最早“出海”的中国装备制造企业之一,振华重工在践行“一带一路”倡议中展现出蓬勃发展的新姿态。未来,振华重工将持续深入落实创新理念和国际化战略,推动基础设施“硬联通”、规则标准“软联通”、民心相融“心联通”齐头并进,为“一带一路”倡议的可持续发展注入更多生机和活力。振

(供图 / 各单位)

在塞得港再相见

文 / 陆怡艳

黄土漫漫、汽笛声声。这里是被誉为“东方伟大的航道”的苏伊士运河，水面湛蓝而清澈，倒映着瓦蓝的天空。运河上空常常会有海鸥展翅翱翔，时而盘旋上空，时而掠过巨轮。作为连接欧、亚、非三洲的交通要道，每年约有 1.8 万艘来自世界 100 多个国家和地区的船只通过苏伊士运河。



塞得港 SCCT 码头

沿着苏伊士运河一路往北，就是埃及最重要的港口之一塞得港，它被称为“扼守苏伊士运河的‘锁钥’”。塞得港分为东、西两个港区，其中塞得港东港区即苏伊士运河集装箱码头(SCCT)，于 2004 年 10 月启用，埃及 50% 的集装箱运输是通过该码头完成的，在“一带一路”倡议下，塞得港飞速发展，集装箱吞吐量稳定增长。凭借先进的设备、优越的地理位置和高效的集装箱处理能力，塞得港已成为全球集装箱枢纽港和地中海地区最卓越的集装箱码头之一。

7 年前的夏天，振华重工在完成 SCCT 码头岸桥项目交付时，码头用户曾发来感谢信，信中最后写道：“希望我们在塞得港 SCCT 码头未来的项目中能够再见。”此后，该码头又向公司采购过一批 10 台轮胎吊。为了进一步提高该码头的设备和能力，码头用户于 2020 年启动了对塞得港 SCCT 码头的升级，其中最重要的部分就是新增泊位，采购更多的港机设备，包括 12 台岸桥和 30 台场桥。

振华重工的汪倩是对接码头用户的商务经理，“得益于长期的合作关系，我们了解到用户的规划部署，去年秋天项目一开始招标就立即跟进。”由于这次项目设备多、金额大，吸引了众多强劲对手。“我们的产品可靠性高，尤其对于 3E 型岸桥，更具有丰富的生产经验和完备的维保服务。”对接过程中，用户满意于振华重工领先的产品质量，不过对一些技术方案还有疑虑，因此一直举棋不定。

“为了顺利拿下订单，让用户看到我们的实力和诚意，我们前后开了十多次线上会议，优化设计方案，针对用户的疑问一一进行技术性的解答，同时说服他们更换振华重工自主研发的电控系统。另外，我们还提前梳理合同中可能发生的各项问题，比如 SCCT 码头位置特殊，交通不便将会影响现场交付的效率等。”汪倩补充道，“用户也很感动，我们能把各种可能发生的问题提早预警，双方一起想办法克服困难。”最终，12 台岸桥项目于今年年初完成合同签约。

如果说签订岸桥订单过程还算顺利的话，那拿下这份 30 台场桥设备订单可谓是异常曲折。从投标到



马士基 COO Jack Craig 一行参观南通马士基测试机项目

最终获得订单，整个过程经历了约半年时间。负责场桥部分谈判的商务经理陆文婷回想起这段经历，不禁感慨，“因为和其他竞争对手报价方式的不同，我们和用户进行了大量的沟通，同时我们将谈判的重点放在我们产品的自动化优势上。”

虽然公司生产的自动化轮胎吊已在全球许多码头投入使用，但码头用户却是首次采购，因此他们非常谨慎细致。陆文婷和自动化相关负责同志一起，在线上给码头用户开展了标前自动化科普“小课堂”，对公司提供的自动化方案进行详细的解释。期间，还多次对接码头用户的自动化团队，邀请他们到上海总部及江苏南通的生产基地进行实地讲解。

关于自动化的方案可不是“纸上谈兵”。陆文婷介绍说，去年公司和码头用户启动了一个自动化轮胎吊测试机项目，在对旧机器进行翻新后，添置了自动化设备、重新布设了电控系统以满足自动化测试需求。“后续，埃及塞得港这个项目在发运前的自动化功能将提前在这台测试机上完成，保证设备发运到码头现场后能尽快投入使用。”就这样，“双管齐下”的努力帮助公司赢得了这份来之不易的订单。

如今，由公司制造的新一批设备正在两个基地如火如荼地生产，相信在不久的将来，码头用户与振华重工的产品和团队即将在塞得港再相见。

(供图 / 张林飞)

“中国技术” 破解世界难题

文 / 张 婷

“振华重工不愧为港机圈中翘楚，所提供的设备及工程帮助关丹港铝矾土作业真正实现了高效绿色环保！”草木葳蕤的七月，马来西亚关丹港总经理在交付仪式上赞扬道，并在仪式后向振华重工正式提出后续新港项目的供货邀请。

关丹港位于马来西亚彭亨州关丹北方 25 公里，是“21 世纪海上丝绸之路”沿线的重要门户。时间追溯至 2017 年，由于当时关丹港铝矾土出港传统工艺污染严重，同时存在效率低、成本高等问题。当地政府一度叫停，严禁采用卡车直接卸料到码头装船的工艺。在此背景下，马来西亚港口用户立即赴中国开启多轮调研，希望寻找一家极具实力并能提供优秀方案的散货设备总承包商，来集成该工程除土建外的所有设备和系统。

“要知道，这个项目所需要的技术在当时是世界难题。”振华设计研究总院机械院副院长、智慧港口总承包部总工程师茅宏亮回忆道，“铝矾土的物料特性极为特殊，含水率高时易粘结堵料，含水率低时易扬尘污染，业主方从南到北寻找了多家公司，都未找到满意的合作对象”。面对用户的高标准、严要求，振华重工项目团队没有退缩，做方案时考虑的更加细致、准备的更加充分。最终，凭借专业、全面、到位的设备总承包服务及装卸系统方案，获得用户青睐，并成功签下了公司首个海外散货系统总承包合同。

万事开头难，虽然公司具有丰富的海外设备项目经验，但面对首个海外散货系统总承包工程项目，项目部还是面临了许多困难与挑战。由于此前海内外并无此类铝矾土连续装卸的成功经验可借鉴，所以首先面临的的就是装卸技术的设计和攻关，难度指数极高。项目技术开发工程师郭立观回忆道：“当时时间紧、任务重，我们研发团队加班加点地查资料、做实验、论证方案。”同时，公司协调统筹各方资源，邀请了业内专家多次进行方案可行性探讨。

最终，项目团队在短短三个月内，完成了全部

设计工作。经多轮审查论证，项目所有设计均获得港口用户及马来西亚第三方审查公司的高度认可。“我们的设备不仅达到了用户要求的系统设计能力，在处理含水率较高的铝矾土上，能力远超出合同规定的定义值。”谈及关丹港项目初期建设的过程，时任项目副经理胡一任感慨万千。铝矾土采用连续取料输送的世界难题就此破解。

大道终致远，海阔纳百川。振华重工作为港口机械设备的建设者、优质系统总承包方案的提供者、设备全周期服务的保障者，始终秉持高质量履约原则，用智慧与汗水在丝路上耕耘。“一带一路”倡议源于中国，而机会和成果属于世界。得益于“中国技术”，关丹港口严峻的环境污染问题迎刃而解，绿色环保的设备更是提升了码头作业效率，让新时代的“丝路”焕发出新的光彩。

阳光下，关丹港墨绿色的海岸线熠熠生辉，绿色发展的主旋律“荡漾”在波光粼粼的海平面上。远远望去，刻着“ZPMC”铭牌的铝矾土装卸设备，像一座蓝色桥梁横亘关丹港，将见证更多的“中国智造”为共建“丝路”贡献智慧与力量。

（供图 / 郭立观）



关丹港铝矾土设备总装现场

关丹港铝矾土设备卸载现场

“海外制造”实现零突破

文 / 李天意



停靠在 PSA 码头的 IGV 无人驾驶导引车

“刚开始的时候什么都没有，我们是从零开始筹备的。”亚洲区域中心总经理杨浩回忆他最初寻找设备工厂时的场景。而现在，走进马来西亚森美兰州芙蓉市的大型厂房，46 台自动驾驶导引车 AGV 项目正如火如荼地陆续制造，2 台完工的 AGV 乘上“专车”，不久前到达了新加坡 PSA 码头。这是公司首次在海外工厂完成设备制造任务，标志着振华重工由“业务国际化”向“公司国际化”的转型迈出了关键一步。

2022 年，正值疫情，PSA 项目的招标又在最紧要关头，“用户提出，会优先考虑可以在新加坡或周边地区生产的供应商。”振华设计研究总院机械工程师胡文辉说道。

以此为契机，振华重工开始探索在海外制造的可能性。当务之急就是了解当地的营商环境。据世界银行《2020 年全球营商环境》显示，马来西亚营商环境在全球 190 个经济体中排名第 12 位，在东盟地区仅次于新加坡。为了鼓励外国和国内企业在装备制造领域投资，马来西亚政府为装备制造业提供了一揽子法律、税收等支持政策。值得一提的是，相比其他港机设备，AGV 也具备了海外制造的条件。它具有体积小、结构简单、标准化程度高的特点，这不仅减少了建造过程中对资源的依赖，也降低了出现重大技术改动的风险；而且在用户码头周边地区生产，利用陆路运输就可以完成交付。

于是，亚洲区域中心、营销总部和振华



亚洲区域中心 PSA 首批 AGV 发运仪式

设计研究总院旋即组建工作小组，前往马来西亚、新加坡的五家工厂实地考察，经过为期 3 个月的调研后，工作小组一致认为马来西亚工厂的钢结构制作、装配场地和人力成本三方面有较强优势，最适合公司“海外制造”的首次尝试。

但马来西亚的三家工厂都没有机床，无法加工 AGV 的车架主体等大结构件。结构件供应商分别提出了不同的机加工方案，但经过多轮沟通，还是无法达到精度标准。

接下里的两个多月，杨浩又带领亚洲区域中心团队深入考察，终于找到一家带有机床的成熟工厂。万事俱备后，工作小组即刻撰写了一份详尽的可行性报告，经公司研究决定，在马来西亚开启属地化制造的试点。公司副总裁沈秋圆亲自带队考察。一家具备合格的钢结构制作能力、机加工能力的工厂，成为首选。

“‘海外制造’能够成功迈出第一步，靠的是合力。”回顾这一年来从合同签订到产品发运的过程，杨浩感慨地说：“运营管理部、生产管控总部、营销总部、上海港机重工，每一个环节都离不开‘战友们’的大

力支持。”

在马来西亚的工厂里，经常会出现一群人围成一圈热烈讨论的场景，振华设计研究总院的电气、机械、液压工程师耐心指导着当地的工人，“这是我第一次安装 AGV，我感觉很新奇，学到了很多。”当地工人山姆说。随着首批 2 台 AGV 的发运，公司“海外制造”的探索正在成为现实。 [振]

(供图 / 胡文辉)



IGV 无人驾驶导引车

与非洲伙伴共架友谊之桥

文 / 杨 嵘

莫桑比克马普托大桥

在非洲国家莫桑比克共和国首都马普托，一座主跨达 680 米的悬索桥——马普托大桥已成为当地的标志性建筑，也是公司践行“一带一路”倡议的闪亮名片。

五年前，装载着非洲最大主跨径悬索桥——马普托·卡滕贝大桥钢箱梁的十万吨级巨轮“振华 24”轮缓缓停靠马普托港。这艘来自中国的货轮承载着马普托当地居民打破交通限制，过上美好生活的愿望。

马普托大桥横跨莫桑比克马普托湾，是“一带一路”合作项目之一。公司承建其主桥的钢结构部分，工程总重约 8100 吨。这也是公司承建的首个海外钢桥施工项目。

因天堑马普托湾，莫桑比克首都马普托被分成南北两部分。北岸的马普托城区已发展成数百万人口

的中心城区；而南岸的卡滕贝地区却因交通受限发展滞后，一家人挤一间茅草屋的情况并不少见。当地小伙儿达特菲尔便是在这样的环境中生活的。

2017 年 10 月，公司 7 名管理人员及 51 名施工人员远渡重洋来到马普托，正式启动桥位现场施工进度。按计划，项目部要聘用数十名当地人补充进施工队伍。经人介绍，达特菲尔前来应聘，成为振华团队的一名打磨工。

初入项目部，达特菲尔保留着原来的生活习惯，因此经常错过早班会。心知地域文化的差异性，项目副经理陶林将他带在身边，让他感受中国工人是如何工作的。

“你看箱梁外表面面漆的拉毛工艺，拉轻了，无法满足质量要求，验收就通不过；拉重了，面漆的损耗增加，成本就高了。”听着陶林细细讲述一些乍看容易忽

略的施工细节，达特菲尔对中国工友们的造桥技艺充满佩服和向往，脱口问道：“我也可以学吗？”看着达特菲尔既惊奇又渴求眼神，陶林笑咪咪地回答：“只要你肯学，我们包教包会。”

耳濡目染下，达特菲尔学习中国施工人员吃苦耐劳和踏实肯干的劳动精神，沉下心来干活。几个月后，他因技术出色，从一名学徒工升级成当地员工的带班，薪资也上涨了 3 倍。技术学到了，收入变多了，生活也变好了，达特菲尔每天工作都精神奕奕。

和达特菲尔一样的当地人，项目部在施工高峰期聘用近百名。为了迅速与当地人打成一片，项目部全员恶补当地通用语言葡萄牙语，仅数日，就可以比划着与当地人沟通交流。沟通基本顺畅后，项目部又持续开展技能培训，帮助他们迅速适应岗位工作。生活中，项目部重点关注家庭情况不好的员工，邀请他

们一起吃午餐，将“以人为本”的企业文化在非洲的项目现场落地生根。

于细节处的关心和帮助让大家深刻感到振华项目团队的善意和尊重。马普托项目架桥期间，正值莫桑比克湿热的雨季。工人们经常活儿干到一半就要停工避雨。次数多了，大家也习惯了，只等雨停后，桥位现场再次响起此起彼伏的施工声。桥面上，不论是黄皮肤，还是黑皮肤，不论是中国人，还是当地人，大家心里只装着一个目标：早日将大桥架起来。

从 10 月初架设第一片钢箱梁开始，仅用 25 天大桥顺利合龙。“中国速度”让当地人人为之惊叹。项目部成员从现场回宿舍的路上遇到当地居民，经常会收获他们用大拇指表达的“赞”。

时间一晃，距大桥通车近五年，“一带一路”倡议也在莫桑比克结出丰硕的成果。这座中非友谊之桥不仅将马普托与南非边境口岸以及莫桑比克旅游胜地“黄金角”串联起来，成为贯穿南北的陆地交通主干道，更凭借“一桥之力”，撬动当地经济。如今的卡滕贝地区新楼林立，一改往日的贫瘠景象，与马普托城区连成一体。在这欣欣向荣的景象里，如达特菲尔一样在大桥建设期间培养出的 5000 余名本地技术工人融入当地各产业中，带动更多人用双手创造幸福美好的生活。

（供图 / 朱聪）



项目部成员与当地员工合影留念

希望之光“点亮”巴拿马

文 / 薛闻远



巴拿马科隆城福利院光伏项目举行完工交接剪彩仪式



国际公益组织扶轮社授予振华重工“2023 年杰出赞助商金奖”及“光伏能源系统项目金奖”

8 月份的巴拿马笼罩在一片炎热之中,科隆城里一场庆祝上海振华重工捐赠给普罗维登斯之家(非盈利儿童福利院)光伏电站的竣工剪彩仪式正在举行。

普罗维登斯之家是巴拿马第一家专门收养特殊需要儿童的福利院,旨在为特殊需要儿童提供照顾、营养、医疗护理和教育,改善并让他们过上正常的生活。但随

着近几年福利院收养人数增加,福利院用电量大幅度提高,电费飙升,资金陷入紧张情况。为了满足福利院用电需求,降低电费成本,全球最大的公益组织之一扶轮社(Rotary club)发起了一个光伏电站捐赠项目。

“积极承担社会责任一直是振华重工的优良传统,尽管来到海外,这个传统我们也不能丢。”振华重工拉美区域中心负责人钱伟勇说,“当巴拿马城扶轮社的轮值主席、MIT 码头副总裁南希·安德拉德·卡斯特罗(Nancy Andrade Castro)邀请我们的时候,我们当即决定要为此个项目出一份力,这是非常有益于当地人民的一件事。”

2016 年,振华重工进军光伏发电领域,负责为客户提供光伏发电系统的评估、设计、实施、运营等一站式解决方案,并取得了不俗的成果。多年来投资建设了 31 个项目,总装机容量近 100 兆瓦,截至 2022 年 12 月底,已累积产生绿色电力 2.66 亿度,投资运营电站 2200 多个。“正好公司就有光伏业务,我们可以捐赠自己建造的光伏电站,这也代表了我们的诚意。”钱伟勇说,“从某种意义上说,这也是振华重工的光伏产品首次进入巴拿马。”

拿定想法后,振华重工拉美区域中心当即找 MIT 码头商议,确定由振华重工提供光伏电板,MIT 码头负责项目施工。MIT 即曼萨尼略国际码头,位于巴拿马运河大西洋入口处,紧邻科隆自由区,是上海振华重工拉美区域中心的良好合作伙伴。方案通过公司审议后,钱伟勇立即把订单发回国内。收到订单,振华重工以最快时间将产品备好并装船发运。寄寓着“希望之光”的光伏电站,开始漂洋过海,运往巴拿马。

项目竣工剪彩仪式放在普罗维登斯之家院子的车棚中举行。车棚上面覆盖安装着振华重工拉美区域中

心捐赠的光伏电板。高大茂密的棕榈树、雪松、橡胶树映衬其后,构成一幅天然的绿色背景图。这个电站总装机容量约 60 千瓦,由 108 块光伏组件组成,该光伏发电系统选用超高功率双面双玻光伏组件进行太阳能采集。投产后平均年发电量约 8.4 万千瓦时,每年可节约标煤约 28 吨、减少二氧化碳排放约 78 吨。

参加剪彩仪式的,除了项目主要负责人,还有三位小朋友。她们是普罗维登斯之家收养的儿童。仪式上,她们一位帮忙捏住蓝色彩条,一位认真地扶住普罗维登斯之家创始人马特·赫斯佩思(Matt Hedspeth)的右手,另一位小朋友由于身体原因靠躺在硕大的黑色轮椅上,但仍旧伸出能动的脚趾搭在马特·赫斯佩思的左手手背上,以自己的方式庆祝仪式。钱伟勇说:“看到这些儿童脸上洋溢的笑容,我由衷感到这件事做的值得。”

马特·赫斯佩思说:“我们福利院收养有大约数十名特殊需要儿童,其中有些儿童的康复锻炼需要专门的医疗设备,这需要大量的电力。我们非常感谢振华重工捐赠的光伏电站,及时解决了我们的用电需要,这下有更多儿童可以得到治疗了,非常感谢中国朋友们。”

项目完工交接后,国际公益组织扶轮社授予振华重工“2023 年杰出赞助商金奖”及“光伏能源系统项目金奖”。

南希·安德拉德·卡斯特罗说:“振华重工是一家有责、有爱的企业,他们用实际行动证明了企业的担当,传播了正能量。这个项目会成为联结中巴友谊的又一座桥梁。”

(供图 / 钱伟勇)

车棚式光伏电站



高质量发展要求下， 钢桥建造 如何发力？

文 / 周 维

桥梁是人们打破地理限制、连接不同地区、推进社会经济发展的重要交通纽带。世界桥梁建造源远流长，随着科学技术的发展，建造桥梁的材料和方式不断迭代，钢桥成为当今桥梁建造技术的先进代表和未来发展的重要方向。

振华重工自承建美国新海湾大桥以来，深耕钢桥市场多年，桥梁建造业务遍及亚洲、欧洲、美洲、澳洲和非洲的数十个国家和地区，并稳居国内钢桥市场的第一梯队。那么未来的钢桥建造可以从哪些方面发力，来适应高质量发展的要求呢？



钢桥有哪些优势?

随着经济的快速发展和城市化进程的加速推进,社会对桥梁的需求日益增加。钢结构桥梁即钢桥,强度高、耐久性强,在大型桥梁和特殊桥梁项目中的应用逐渐增多,成为桥梁建设的重要组成部分。

相比传统混凝土桥梁,钢桥有许多明显的优势。首先,钢构件断面小、自重轻、强度高,适于建造荷载很大的桥梁,便于运输和吊装。其次,钢材有良好的塑性和韧性,钢结构桥的抗震性能和抗风性能也更好。最后,钢结构加工简易而迅速,施工占地面积小,一些部件可在现场制作,安装方便,施工周期短,且钢桥的安装方式和钢结构构件精度高的特点使钢桥质量稳定,钢结构桥梁在使用过程中也易进行加固、接高、扩宽路面等改造。

近年来,交通运输部发布了一系列政策来推动我国钢桥行业的发展。2016年,发布的《关于推进公路钢结构桥梁建设的指导意见》指出,大力推进公路建设转型升级,提升公路桥梁品质,充分发挥钢结构桥梁性能优势。2017年发布《关于开展公路钢结构桥梁典型示范工程建设的通知》(以下简称《通知》),明确开展公路钢结构桥梁典型示范工程建设。《通知》要求,钢结构桥梁应按照“工业化制造、装配化施工”要求组织建设,改进建设组织和质量控制管理方式,积极利用BIM(建筑信息模型)等技术手段改进质量管理;同时,要科学选择桥梁结构型式,强化钢结构构造设计。在国家政策的支持下,中国加速迈进“钢桥时代”。



南沙大桥



海文大桥



钢桥行业有哪些痛点？

我国钢桥行业快速发展,同时,行业的困境和痛点也日益凸显。首先是市场竞争的加剧。大量标准样式钢桥已经建造完毕,涌现出越来越多结构复杂、桥位环境恶劣的跨江、跨海及跨越山谷的大桥,钢桥市场的竞争异常激烈,特别是在大型工程项目中,各家企业争夺订单,价格战也常见。其次是技术创新的需求。随着科技进步和工程技术的发展,钢桥行业面临着不断提升技术水平的需求。新型材料、先进工艺,数字化、智能化等创新技术不断涌现,给传统钢桥行业带来了挑战。

再次是专业人才的缺乏。钢桥行业需要具备专业知识和高技能的人才,包括设计师、工程师、技术人员、熟练的施工人员等。然而,目前存在着人才供给不足的问题,尤其是高级技术人才的匮乏,限制了钢桥行业的发展和技术进步。最后是质量要求及产品价格冲突。钢桥是百年民生工程,对项目质量要求极高。然而在市场竞争之下,产品价格却不断走低。这就要求钢桥制造企业在技术创新的同时,要不断降低施工成本,提高生产效率,以满足越来越高的钢桥制造质量要求。



面对新形势，如何实现高质量建桥？

在钢桥建造发展过程中,随着新材料、新装备、新工艺的研究和应用,钢桥制造技术、生产效率及质量把控的要求不断提高。

大力发展钢桥 BIM 技术是高质量建桥的关键。BIM 技术(建筑信息模型)发展给钢桥建造的设计、施工、运维以及参与各方在技术开发和管理方面带来无限发展可能,具有非常广阔的应用空间。钢桥制造厂商需要依托 BIM 技术建立项目管理协同制造云平台,以三维 Tekla 模型为基础,通过对物料管理系统、三维加工一体化技术、焊缝信息管理系统、虚拟预拼装技术和生产物联管理系统的研究,实现工艺余量、焊缝、产品进度、产品测量检验、追踪库存等信息在钢构 BIM 生产信息化平台中的集成和共享。

提升钢桥制造的智能化水平是高质量建桥的重点。随着《中国制造 2025》国家战略的实施,智能制造作为其中一项重要内容受到各行业的重视。桥梁钢结构具有构件尺寸大、结构多变、质量要求高、生产环境复杂等特点,给生产制造造成一定困难。钢桥制造厂商需要开展以智能下料切割生产线、板单元智能焊接生产线、节段智能总拼生产线、钢箱梁智能涂装生产线、车间制造执行智能管控系统为核心的“四线一系统”建设。目前,机器人焊接生产线的研究应用使钢箱梁桥 90% 以上板单元实现了自动化焊接。另外,要进一步提高钢板下料切割、板单元焊接技术,大力推进钢箱梁节段无损伤组装技术、节段自

动化焊接技术、智能涂装生产线的建设工作。

创新钢桥焊接技术的应用是高质量建桥的必经之路。首先是 U 肋全熔透焊接技术的应用。钢桥正交异性桥面板结构病害在国内外较为常见,是世界性难题,而 U 肋焊缝裂纹是钢桥正交异性桥面板结构的第一大裂纹源。钢桥制造厂商可以通过对 U 肋内焊二氧设备改造,实现 U 肋内侧焊缝采用平位细丝埋弧焊,外侧采用船位粗丝埋弧焊,并配备激光跟踪,极大地保证全熔透焊缝的探伤合格率,形成强度高、韧性好、性能有保障的全熔透焊缝,从而实现 U 肋角焊缝全熔透焊接,提高钢桥抗疲劳寿命。此外,应用等离子气创技术去除焊缝残渣,在薄板上应用激光焊技术、在钢塔上应用埋弧横焊技术等,都能大大提升钢桥质量,提高钢桥的使用寿命。

未来,我国将依托大型跨海通道等重大工程建设,加速钢桥行业高质量发展,逐步实现钢桥行业“经济、绿色、可持续”发展。 [4]

(供图 / 徐金鑫)



U 肋埋弧焊接机器人

钦州自动化码头的运营“智囊”

文 / 李天意

一提到“智囊”，大家都会想到足智多谋、运筹帷幄等词语。如今，广西钦州港自动化码头也迎来了一位“智囊”——智能运维中心（Intelligent Operations Center，以下简称 IOC）。

“这是港口业内第一次应用 IOC。它把不同供应商和各种自动化子系统的数据整合到 IOC 里，打通了‘数据孤岛’，实现了码头的主动运维。”今年 8 月的一天，钦州自动化码头信息经理郭豪威在项目现场介绍道。

在自动化码头投入运营后，数据规模成几何级数增长。如果缺乏多维度的数据统一治理和分析，不但

大量数据无法被有效利用，还会导致码头用户无法快速定位故障问题，只能通过收集不同系统的数据逐项分析、排除问题。一般要花费几小时甚至几天时间才能找到问题来源，这一直是码头管理的痛点。

而如今，由振华重工自主开发的码头运营“智囊”，将设备控制系统、码头操作系统、调度系统、单机设备、码头日志和第三方数据进行整合，面向业务决策、运营指挥、运维监控等多重角色，为用户开发了 IOC 港口智慧大脑智能大屏，依托大数据处理、人工智能、3D 数字孪生、CCTV 等技术，实现全景监控，实时反馈潮汐、海陆侧总览、码头吞吐量、工班效率等信息，实现视频与

数据的同步“可视化”。“用户高层管理者可以看到码头当月和上月的环比数字对比、当天效率数据等，对整体操作指标进行监控和洞察，可以快速做出决策。”郭豪威说道。

不仅如此，“智囊”更像一位细致的“医生”，能深度诊断设备、系统、服务器的各种“亚健康”问题，查看服务器过往六小时的运行“体检报告”，并提供针对性“治疗方法”。“总机房与三大设备系统的服务器紧密相连。一旦码头设备发生故障，屏幕上就会出现一个红色小铃铛预警标志，并将故障和推荐处理方案发送到用户手机或电脑上，让用户可以即时快速决策。”软

件工程师原好介绍道。

此外，通过 IOC 港口智慧大脑智能大屏，还能将码头情况尽收眼底，无人驾驶导引车 IGV 在集装箱堆场往来穿梭，岸桥高效运转装卸船舶，一派繁忙景象，与在码头现场看到的生产场景无异。

值得一提的是，IOC 不仅能够掌握码头全域内的运营情况，还提供了二次开发平台，用户可以根据码头业务情况拓展功能，进一步推动“智囊”更新升级，以智慧力量护航北部湾港钦州自动化码头安全高效生产。

（供图 / 陆志东）

北部湾钦州港智能运维中心

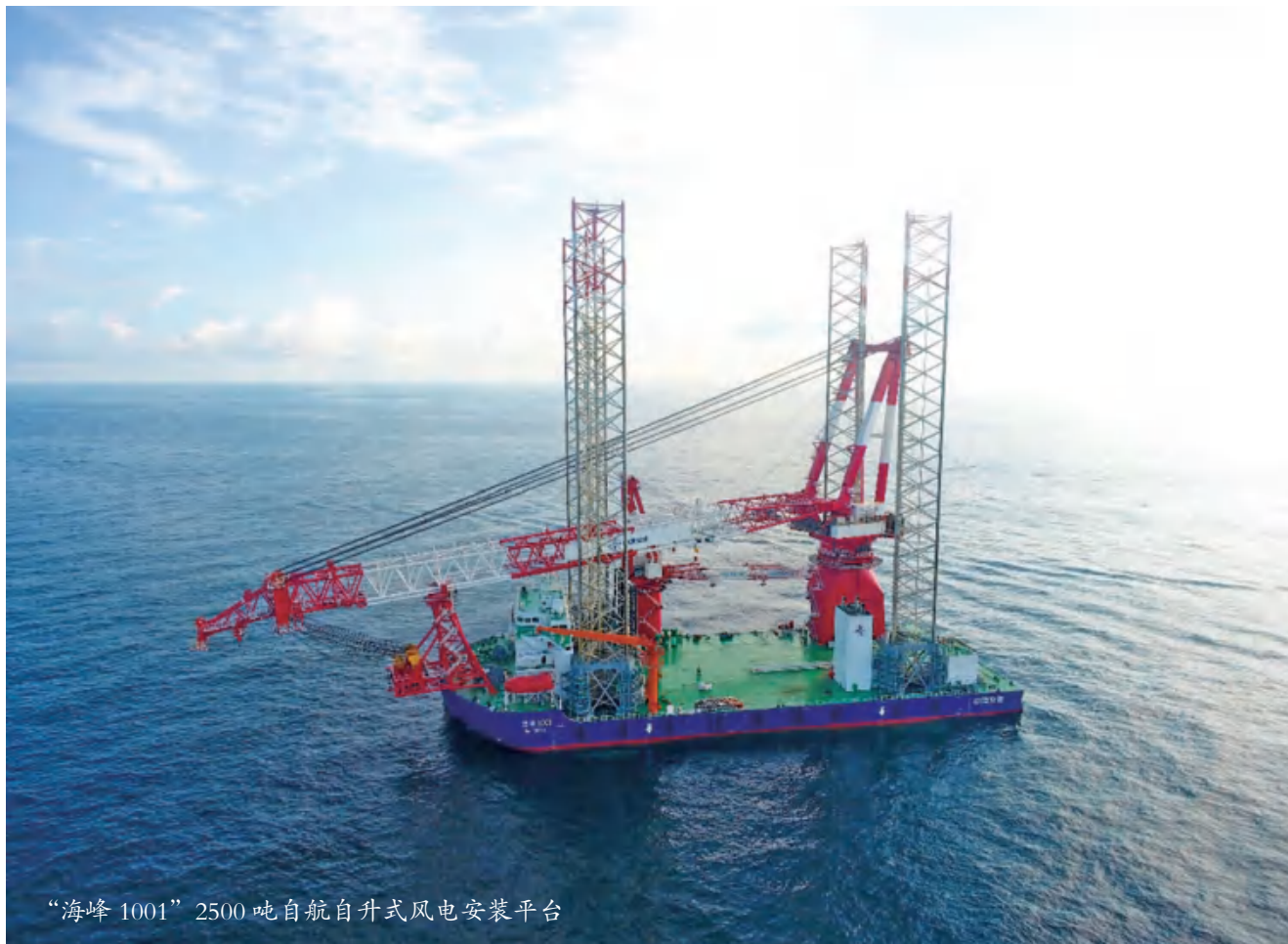


身轻能起千吨重

文 / 章 杰 赵 瑛

“这两艘‘海上利器’均为我国自主研发设计，核心及配套部件全面实现国产化。”9月19日，央视记者走进振华重工启东海洋工程，报道了正举行交付仪式的两艘国内一流、国际领先新一代海上风电施工装备。

记者口中的“海上利器”是由中交海峰风电投建、振华重工设计建造的“海峰 1001”2500 吨及“海峰 1002”1800 吨自航自升式风电安装平台。其上部配置的起重机均采用新型绕桩式设计，使“海峰 1001”成为目前国内起重最大、吊高最高、自重最轻的风电安装平台。



“海峰 1001”2500 吨自航自升式风电安装平台

新一代超大型绕桩式海上平台起重机由振华重工“严兵浮式起重机创新工作室”研发。“该机型刷新了国内自主研发海上风电安装平台起重机的性能指标纪录，具有自主知识产权，达到国际领先水平。”振华重工副总工程师、振华设计研究总院总工程师严兵介绍道。

随着全球风电市场“井喷式”发展，海上风电向“深水、大型、远海”发展，对海上风电安装平台的起重和吊高提出更高要求，打造更精简的甲板空间和更轻量的整机重量已成为行业趋势。于是“绕桩式”概念应运而生，这种设计让起重机整体“环绕”在桩腿上，以桩腿为支柱，省去起重机原支柱占用的空间和重量。

要实现这一设想并不简单，作为“严兵浮式起重机创新工作室”的领衔人，严兵带领创新工作室积极抓住市场机遇，着力开发新机型。“要实现起重机的起升重量大、高度高，还要能耗低、自重轻，满足多种深远海工况，对研发人员来说挑战极大。”创新工作室成员、新机型机械设计总负责人陆凯说。

创新工作室面临的第一个难题，是如何在起重机尾径不到 20 米的回转底盘上布置 10 多台大型绞车和电器房。国外绕桩式起重机布局是桩腿直接穿过底盘，“这种设计光是桩腿和桁框架就占了大部分的底盘面积，绞车和电器房的布置局促，整体重量难以下降。”陆凯分析道。在没有任何参考的前提下，创新工作室研究将桁框架和人字架的组合直接简化为人字架支撑型式，省去了桁框架的大部分结构，极大压缩了结构体量，相较传统机型减重超一成。

第二个难题是对起重机臂架的研发。臂架长度达到 150 米以上，在满足大吨位吊载和拖航安全性的要求下，仅减少设计余量已难以满足需要。创新工作室根据受力情况不同，研究从臂架根部到头部采用不同截面和材料，关键部位加强，次要部位酌情减重，并以高强度钢板做主弦杆，在保证臂架强度和刚度的同时再减轻臂架约百分之五的自重。

通过不断攻克难题，团队还提出臂架锁钩装置、主动式小车缆风系统等创新设计，结合电控系统、人机交



新一代超大型绕桩式海上平台起重机

互系统、整机失效模式与影响分析的全面优化，可满足 15 至 20 兆瓦风电设备吊装需求及恶劣工况下的施工。

作为超大型轻量化风电安装起重机的代表，振华重工自主研发设计的新一代超大型绕桩式起重机性能全方位提升，满足大型高效、轻量智能的发展趋势。除应用在近期交付的中交海峰风电两大平台外，还应用至“白鹤滩”号 2000 吨、迭代应用至“中天 31”号 1600 吨以及在建的正力海发 3500 吨海上风电安装平台上。

未来，振华重工将继续为海上风电安装平台提供船体、抬升系统和电控系统等从设计、施工到调试交付的一体化解决方案，为提升我国海上风电装备水平、实现清洁能源开发提供有力支撑。

（供图 / 赵瑛）

国内起重能力最大海上风电安装平台是怎样“炼”成的？

文 / 李天意 顾琳

9月19日，由中交海峰风电投建、振华重工设计建造的“海峰 1001”2500吨自升自航式风电安装平台隆重交付。作为国内目前建造的起重能力最大、国内首艘2500吨级第四代海上风电安装平台，“海峰 1001”将服务于海上风电场进行各项风电工程作业，包括20兆瓦级海上风机的塔筒、机舱、叶片的安装和风机基础施工，以及其他海上吊装作业或支持，为我国海上风电走向深远海，实现海上风电清洁能源高质量发展再添“利器”。“海峰 1001”从设计建造到交付的过程中，汇聚了项目团队的集体力量，让我们走近“海峰 1001”项目团队，了解这艘“海上利器”背后的故事。



“海峰 1001”2500吨自升自航式
风电安装平台试航



Q1.“海峰 1001”在设计过程中遇到和应对过哪些挑战？

“海峰 1001”项目总工程师 李俊林：作为首制船，“海峰 1001”在设计过程中遇到了很多困难。技术团队从前期方案讨论到设计出图直至最后完工交付，全程提供技术支持。

主起重机核心构件回转支承轴承的制造极为重要。设计工程师联合轴承制造厂家，研究采用剖分式三排圆柱滚子式回转支承轴承，在达到设计参数的前提下，减小了制造难度。

该平台的桩腿长度达120米，在平台自重近27000吨、起重机吊重、跨距如此之大的情况下，对桩腿的强度提出了更高要求。设计工程师参考钻井平台的经验，反复计算优化，在不增加齿条板厚度的前提下，加大半圆板直径以及差异化设计，有效控制成本。

另外，冲桩系统是平台能否顺利拔桩的关键，尤其在入泥较深的海域，如不能及时拔桩不仅影响施工效

率，甚至会威胁平台安全。设计工程师围绕冲桩泵的选择型、配置，冲桩管路的设计，喷嘴的数量、布置及角度，多次召开专项讨论及模型评审，听取业主的施工经验，使冲桩效果达到最大化，并且实现所有支管、喷嘴可拆卸，便于用户未来进行维护。

“海峰 1001”项目技术经理 张家齐：这个项目整体建造周期为20个月，设计工期紧。2022年3月中旬，正是设计团队出图的高峰期，为了图纸能准时发放到基地进行设计建模工作，在设备有效资料不足的情况下，项目团队利用公司集设计和生产为一体的优势，节约项目建设时间。例如设计图纸A版送船东和船级社审核的同时，提供给基地作生产设计参考，待船东和船级社审核后，生产设计再对修改部分进行微调。团队通过严格控制图纸质量和进度，保证了项目如期进行。



试航途中的风景



Q2. 公司如何整合资源,联合推进项目刚性履约?



调试团队正冒雨进行绞车调试报验工作



调试团队正在进行机舱二氧化碳报验

“海峰 1001”项目总策划 杜洛兵:我认为可以归功于丰富的经验、充足的产能资源和组织有序的项目团队。

首先,公司有丰富的钻井平台设计和建造经验,曾自主研发了“振海”系列,培养了优秀的设计、工艺人员和项目管理团队。二是充足的产能资源。振华重装有 6 个基地,有丰富的产能资源进行系列化生产。船体、主起重机和抬升框架和桩腿分别在不同的基地制造,同时推进节省时间。三是组织有序的项目团队。首先,“提前”是个关键词。提前交付必然要提早谋划,尤其是对于关键节点的把控。例如,将核心构件抬升框架与主船体同步建造,最后早于船体完工。其次,专业的抬升系统调试团队也进行了预调试工作,所以平台在水下之后,仅用半个月就完成了站桩工作。最后,在平台还没就位之前,团队也对主起重机进行预调试。平台就位后,团队用 3 至 5 天时间对底盘、人字架、臂架这“三大件”进行吊装,在一星期内就完成重载试验。

“海峰 1001”项目协调小组联系人 刘伟秋:这个项目由振华设计研究总院设计、振华重装、振华传动组织生产,交叉接口多,协同难度大。为实现高效履约,公司多方联动,保障交船节点。

项目伊始,公司就成立了项目领导小组、协调小组和执行小组。领导小组每季度同用户高层开会,推进事项快速决策。协调小组建立“双周会”机制,协同各方执行节点。项目经理部组织项目执行工作,同监理建立周例会制度,及时解决现场问题。三层组织机构紧密协同,系统高效推进项目全过程管理。

项目于 2022 年 1 月签订合同,恰逢春节前夕,节后上海又受疫情影响,给设计、物资采购谈判、生产准备带来极大挑战。协调小组联合各生产主体把物资采购谈判转到线上,抢抓时间。



参加试航的“海峰 1001”项目成员

2022 年第四季度,生产单位连续遭受台风、限电、疫情影响,为保障 2022 年底“主船体贯通”的节点,项目团队充分调动分包商的积极性,设立赶工专项方案,通过增加施工人力、落实责任人等方式,奋力实现节点目标。

项目的实施过程不是一帆风顺的,大家一直坚持“只为成功想办法”的理念,实现项目提前交付,提升了公司的海工品牌形象。项目团队还将不断总结经验,推广到其他项目的管理实践中,为公司高质量履约贡献力量。



“海峰 1001”在进行全程升降试验



Q3. 项目团队是如何统筹协调保证平台按时下水的？

“海峰 1001”项目副总工程师 周路林:该平台有 4 根桩腿、12 组抬升框架,单个抬升框架重 130 吨,根据以往项目建造经验,抬升框架的建造和搭载周期非常长,是整个项目能否按期下水的关键。为确保该平台下水节点,项目组提前策划并组织专家讨论研究,最终确定将抬升框架和船体同步生产,40 天内完成了 12 组抬升框架预拼和搭载工作,为平台桩腿插桩争取了时间。

此外,船坞的水位对于船出坞影响极大,稍有偏差,平台都可能出不了船坞。然而可供参照的潮汐表是一年一更新,今年潮水比表中预测数值低了很多,偏差较大,所以我们一直担心无法按时下水。

当时距下水仅剩三个月,我们每天都会参照潮汐时间表,到码头前沿勘测、记录潮水高度,共测量 100 多组数据。多次对比和计算后,确定了潮汐表的数值和实际潮水偏差值,并测算到潮位最高的时间点,确保平台在出坞当天有足够的潮水,保证平台出坞安全。



项目团队加班加点为试航作准备



Q4. 该平台从 2023 年 6 月 6 日下水,到 8 月 8 日海上航行试验,比常规进度缩短了一个月,请问团队是如何做到的？

“海峰 1001”项目起重机总装调试 蔡卫跃:起重机项目部在接到该平台下水后的总体调试试航计划后顿感压力,通常下水后在两个月内完成起重机总装穿绳、调试及取证几乎不可能,这比同类型起重机调试取证周期整整缩短了一个月。

为了将原本三个月的施工周期缩短至两个月,项目部根据总体计划进行施工任务倒排,梳理出计划实施的难点,尽可能把工序前移。第一步是在起重机总装前完成绞车机构超速试验及部分穿绳工作,缩短穿绳周期约 15 天;第二步是梳理与起重机穿绳调试干涉的工序,并重新调整计划,降低船体施工对起重机部分的影响;第三步,针对调试取证周期短、任务重的特点,优化空载调试及吊重试验并提前准备。吊重试验期间进行 24 小时作业,起重机调试团队、船体供电及业主监造团队协同努力,最终在 8 月 4 日完成起重机的吊重试验,为试航奠定基础。

(供图 / 徐金鑫 李俊林 李蒙 周路林)

A booming Silk Road makes a better world!

by **Xue Weihui**

The yellow desert stretching thousands of miles witnessed the echoing of camel bells, and the stormy waves could not stop the mighty fleet of ships. The Silk Road was an ancient and mysterious network of trade routes connecting China with the Middle East and Europe, and was a bridge that had a lasting impact on commerce, culture and history that resonates even today.

In 2013, China proposed the Belt and Road Initiative for international cooperation, aiming at promoting policy coordination, facilities connectivity, unimpeded trade, financial integration and people-to-people bond in the international community to inject new impetus into the world's economic growth, open up new space for global development and create a new platform for international economic cooperation.

Ten years of hard work has yielded fruitful results. Along the ancient Silk Road, China has signed more than 200 cooperation documents on the joint construction of the Belt and Road with more than 150 countries and more than 30 international organizations, and reached agreements on more than 3,000 cooperative projects. In the future, the Belt and Road Initiative will continue to play an important role in promoting economic prosperity and cultural integration of relevant countries and regions. On October 17-18, 2023, the 3rd Belt and Road Forum for Int'l Cooperation was held in Beijing, ushering the Belt and Road cooperation into a new stage of high-quality development.

ZPMC has devoted itself to the great cause of the Belt and Road Initiative cooperation, which is not only a precious development opportunity, but also an obligatory historical responsibility. As a world-renowned heavy equipment manufacturing enterprise, ZPMC has extended its business in overseas market for many years and achieved mutual success by cooperating with users from all over the world.

ZPMC respects the business ethics and trade norms of the host countries. ZPMC is committed to building the Belt and Road into a "road of peace", a "bridge of peace" with heavy equipment, and a "road to prosperity" by connecting global ports with equipment to release the development potential of all countries via their ports, thus realizing great economic integration, great development integration and sharing of great achievements; ZPMC is committed to building the Belt and Road into an "open road" by launching the digital intelligent platform connecting global ports, providing post-market services to users around the world, and working together to build a broad community of interests; ZPMC is committed to building the Belt and Road into a "green road", by constantly studying and developing green and low-carbon port equipment, integrating the design concept of protecting environment into equipment manufacturing, and exploiting a sustainable port operation mode; ZPMC is committed to building the Belt and Road into a "road of innovation" by promoting the digital intelligent transformation and upgrade of the manufacturing industry with technologies such as big data and cloud computing to advance the construction of smart ports and terminals; ZPMC is committed to building the Belt and Road into a "road of civilization". Apart from expanding overseas markets, ZPMC organizes Chinese training courses, builds platforms for school-enterprise cooperation, carries out social welfare activities abroad, and strengthens cultural exchanges.

From ancient time to today, the Silk Road witnesses the blending and cooperation between the East and the West and unfolds a new stage of high-quality development. Now, in the new journey of the Belt and Road cooperation, ZPMC will continue to build a bridge of friendship with Chinese equipment, and injects its strength to the high-quality Belt and Road cooperation.



《采菊东篱下》作者：徐梅



《拼搏进取》作者：陈波





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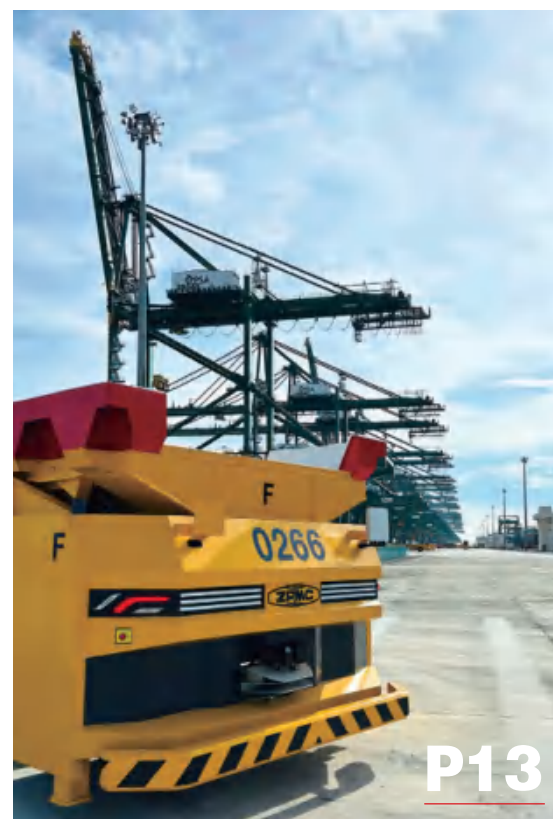
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The 10th Anniversary of the Belt and Road Initiative:
**jointly build a Silk Road
community beyond the horizon**

by Lu Yiyan

The Silk Road stretches for thousands of miles from Asia to Europe, bears a long history of more than 2,000 years, and symbolizes a beautiful wish for peace and common prosperity between the East and the West. In 2013, Chinese President Xi Jinping proposed the Belt and Road Initiative. In the past 10 years, the concept has turned into reality. On the world map, two magnificent traffic arteries originating from China ancient Silk Road reappear in the world vision. In the past 10 years, ZPMC has been a pioneer of the win-win cooperation and a firm practitioner under the Belt and Road Initiative and has seized the historical opportunity to contribute its wisdom and solutions to the countries responding to the Initiative along the ancient Silk Road.

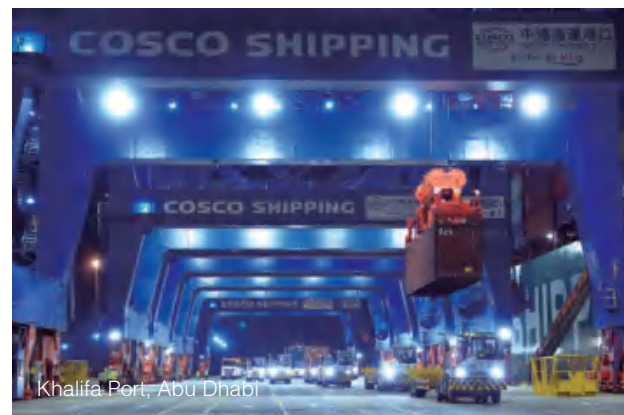
Going global to seize overseas markets

Since 1992 when the first overseas order was delivered, ZPMC, after more than 30 years of development, has grown into the "arm of global trade" in the field of heavy equipment manufacturing. So far, ZPMC has exported its products to 107 countries and regions, which contributing more than 50% of its total revenue, and has provided equipment for 78 countries along the Belt and Road.

Technological innovation acts as the ballast stone of ZPMC's strategy of Going Global. ZPMC insists on independent innovation in the field of port machinery manufacturing, and has launched a series of products such as 3E PLUS super-large STS crane, double-40 ft double-trolley STS crane, energy-saving RTG, automatic RMG, bridge-type grab ship unloader, unmanned straddle carrier and so on, leads the development of container port machinery, promotes the leap-forward development of the industry and upgrades the industrial structure.

Differentiation is an effective way to build the brand of ZPMC. Facing different customers, ZPMC provides customized equipment according to local conditions to meet individual needs. In 2014, ZPMC developed post-Panamax type anti-seismic STS cranes for a customer of Peru where earthquakes happen frequently. In order to resist earthquake, the STS crane is equipped advanced shock insulation device, which can not only resist earthquakes, but also effectively control the overall weight; According to the features of Yangon Port in Myanmar such as long-time renovation and low capacity, ZPMC followed the "light" design concept from beginning to end, and developed a 3000-type STS crane for the port. The crane has a total weight of less than 500 tons, and its operating efficiency increases by 21% compared with that of conventional models, which accurately meets user needs.

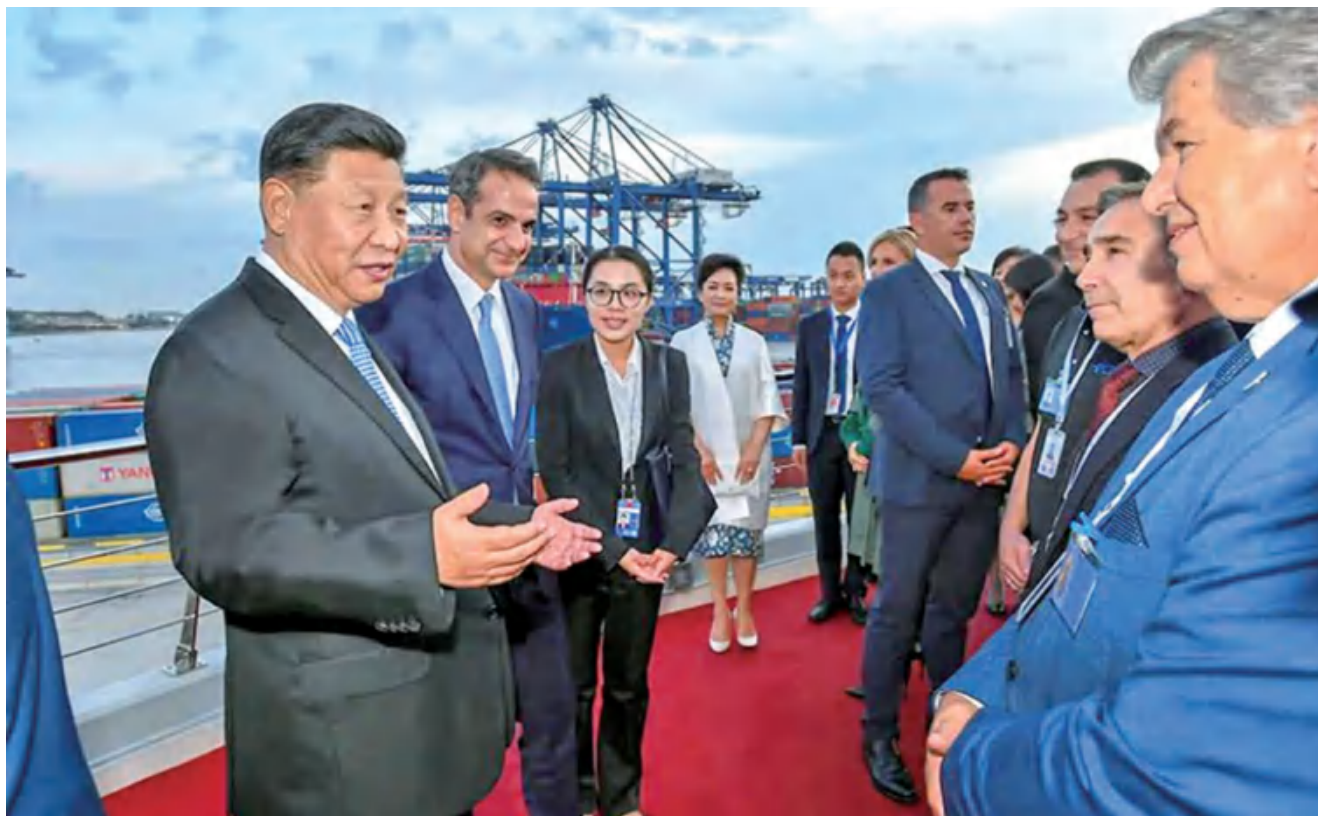
At the same time, ZPMC has deeply explored the field of automatic terminal construction, and has participated in the construction of a number of automatic terminal projects under the Belt and Road Initiative, such as TUAS Port in Singapore, Khalifa



Khalifa Port, Abu Dhabi



Vado Gateway, Italy



Chinese President Xi Jinping, accompanied by Greek Prime Minister Kyriakos Mitsotakis, visits the Piraeus Port project of COSCO Shipping

Port in Abu Dhabi, Vado Gateway in Italy, Laem Chabang in Thailand, and the new Port of Haifa in Israel. Therefore, ZPMC has realized the transformation from a single equipment supplier to a general contractor of integrated system solutions, and from a traditional port machinery manufacturer to a provider of modern intelligent overall terminal solutions.

Bridge construction is also a highlight of ZPMC's capability in building projects under the Belt and Road Initiative. ZPMC actively introduces professional bridge manufacturing equipment to effectively improve its manufacturing efficiency. At the same time, ZPMC first introduced the intelligent manufacturing BIM technology into steel bridge manufacturing, and successfully built a number of bridge projects with novel structures, complex technologies, difficult design and construction, and high technology levels, such as Maputo-Catembe Bridge in Mozambique and Pelesnac Bridge in Croatia, which laid a solid foundation for ZPMC to become a leading bridge manufacturer. With these remarkable projects, ZPMC has contributed China's plan, China standards and China's strength to the countries along the Belt and Road.

ZPMC cannot export its products to the countries along the Belt and Road without the supporting of its ocean shipping fleet.

At present, ZPMC has nearly 20 ocean-going carriers for heavy and special equipment, which can not only transport its port machinery, large steel structures and other products to ports all over the world efficiently, safely and soundly, to ensure on-time delivery and gradually move into the external high-end semi-submersible transportation market. Today, ZPMC has a global presence in the maritime shipping market, with a stable and high-quality customer base.

ZPMC's win-win cooperation wins praises from politicians of various countries

Over the past many years, ZPMC has made more and more friends by jointly advancing the Belt and Road cooperation and the concept of peaceful development of mutual consultation, co-construction and shared benefits has also been widely recognized among many countries. Many national politicians have praised the projects jointly built by ZPMC.

There is an eye-catching "praise" from European friends supporting the Belt and Road Initiative. In November, 2019, Chinese President Xi Jinping, accompanied by Greek Prime

Minister Kyriakos Mitsotakis, visited the Piraeus Port, a flagship project in bilateral collaboration under the Belt and Road Initiative. President Xi Jinping said: "Seeing is believing. I have seen the development and changes of the port and China-proposed Belt and Road Initiative is not a slogan or tale, but a successful practice and brilliant reality. The Initiative upholds the principle of extensive consultation, joint development and shared benefits, and no one makes decisions for others, and instead all participants share responsibilities and benefits in the cooperation." His warm and firm words won warm applause.

In the fifth most important bridge project in Europe—the Pelesnac Bridge in Croatia, and ZPMC participated in its construction. During the bridge construction, Croatian Prime Minister Andrej Plenkovic visited the construction site of the Peljesac Bridge and also praised the Chinese builders for their great efforts to overcome difficulties with fearless spirits and show China's speed and China's strength to the world.

There are also many praises and affirmations from Asian friends supporting the Belt and Road Initiative. In 2015 when the third phase terminal of PSA Port Authority of Singapore opened, Prime Minister Lee Hsien Loong personally operated the STS crane made by ZPMC in the remote control room, and affirmed the efficiency, reliability and competitiveness of the crane. In the same year, in Qatar, thousands of kilometers away from China, then Prime Minister Mohammed bin Abdulrahman Al-Thani attended the welcoming ceremony for the arrival of ZPMC's port machinery. In May, 2022, then Prime Minister Taur Matan Ruak and the government officials of Timor attended the largest port equipment arrival ceremony in the history of the country, the equipment was manufactured by ZPMC. In addition, when former South Korean President Park Geun-hye and the officials from the Marine Department visited the terminal, they also expressed their heartfelt appreciation for the safe, efficient and pollution-free port machinery provided by ZPMC.

As for the African friends participating in the Belt and Road Initiative, there are testimonies and praises given by the local politicians. Looking back at the timeline, in August 2023, a grand completion ceremony for the Alassane Ouattara Bridge was held, and Ivorian President Alassane Ouattara, Vice President Ti é moko Meyliet Kon é , Prime Minister Patrick Achi, and other figures from the Ivorian government attended the event. In December, 2022, Kenya's Transport Minister attended the delivery ceremony of ZPMC's rail-mounted gantry (RMG) cranes at Naivasha ICD station. In July 2022, then Nigerian President Muhammadu Buhari congratulated the local first modern Lekki deep seaport for welcoming the first ship of equipment from ZPMC. In November 2018, Mozambican President Filipe Jacinto Nyusi and his wife and the governmental officials attended the opening ceremony of the Maputo Bay Bridge, which was the first suspension bridge built

by ZPMC in Africa. In February 2016, then Guinean President Alpha Conde and a number of governmental officials came to the Autonomous Port of Conakry to attend the unveiling ceremony of two STS cranes delivered by ZPMC.

The North American friends participating in the Belt and Road cooperation across the Pacific Ocean also gave their praises for ZPMC. In December 2018, ZPMC participated in the 2018 China (Panama) Brand Exhibition. Former Panamanian President Juan Carlos Varela Rodriguez visited the exhibition site and stopped in front of the models of the Hong Kong-Zhuhai-Macao Bridge, Yangshan Phase IV Automated Terminal and others to learn about the overall situation of the projects.

ZPMC has made fruitful outcomes in the Belt and Road cooperation and helped improve the economic development and livelihood of countries along the Belt and Road. At the same time, the care and praises from the political VIPs from these countries will also inject new impetus into ZPMC's high-quality work in the Belt and Road cooperation.



Croatian Prime Minister Andrej Plenkovic visits the construction site of the Peljesac Bridge several times



Former Panamanian President Juan Carlos Varela Rodriguez visits the automated terminal project co-built by ZPMC

Integration and interconnection deepen localized operation

ZPMC has been actively developing overseas markets since its establishment. With the continuous growth of its overseas market share and expansion of its business scope, ZPMC's overseas operations have entered a new stage of refined management and localized operation.

In 2022, ZPMC sped up its internationalization process and divided its global market into eight regions: Latin America, North America, Asia, India and Australia, the Middle East, Africa, Russia and Europe, and set up overseas regional centers. ZPMC's Overseas Regional Center provides services for 36 cities in 25 countries, and it undertakes the responsibilities of market development, sales of spare parts and maintenance. Moreover, it makes ZPMC's overseas development strategy much clearer, especially in the countries participating in the "Belt and Road Initiative", improves its management system, and standardizes its corporate governance, thus injecting strong impetus into ZPMC's



In 2019, ZPMC Latin America subsidiary and Universidad Tecnológica de Panamá formally signed a cooperation agreement



The 10th Anniversary Celebration Ceremony of ZPMC Sri Lanka

localized operation.

The key to improving ZPMC's overseas operation lies in continuously improving the quality of its overseas services and customer satisfaction. To this end, ZPMC strives to cultivate a localized talent team with excellent expertise, high degree of cultural integration, and dispatch in multiple countries by region. More than 90% of the employees of ZPMC's subsidiaries in Southeast Asia, Sri Lanka and Latin America are local people, who participate in the construction of local projects, providing talent support for ZPMC to serve the world. In March, 2022, ZPMC established its first overseas talent center based on the Indo-Australian region by giving full play to its own advantages. After a year's development, the talent center has grown from ZPMC Indian subsidiary's local team of 50 people to nearly 300 people from India, Sri Lanka and Australia, becoming a team composed of overseas professionals with strong cohesion and competitiveness. At present, ZPMC's Overseas Talent Center has 101 engineers engaged in electrical, mechanical, software and sales functions, and 193 skilled workers including welders, steel workers, crane riggers and fitters. At the same time, the center also reserves a large number of professionals in such fields as project management, finance and tax laws, enterprise operation management, marketing, and has training engineers devoted to providing trainings for skilled workers, thus strengthening the echelon construction of reserve talents.

Since its establishment, the Overseas Talent Center has provided after-sales services for dozens of local projects in India, and helped the unloading and delivery of 2 STS cranes AND 4 RTG cranes in East Timor and 2 STS cranes in Papua New Guinea, and many other projects. The Overseas Talent Center team adheres to the concept of "user-oriented", consolidates the long-term cooperative relationship with users, and strives to make the brand of ZPMC be a top choice of users from provision and upgrading of equipment, paid services and equipment maintenance.

In order to build a localized service network, better provide users with spare parts and services, and fundamentally solve the problems of long-term procurement of parts by terminals, ZPMC established a subsidiary Terminexus in 2017, focusing on providing spare parts services for port machinery and large equipment. Terminexus is committed to providing localized services by relying on ZPMC's global network, and has built an integrated e-commerce platform, a visual inventory analysis platform and an intelligent data analysis system, and integrates and optimizes the supply chain system using the data advantages in the global port machinery stock market to help terminal users reduce costs and increase efficiency. At present, Terminexus has cooperated with 326 terminal customers in terms of digital supply chain of port machinery, and helps ZPMC upgrade its one-stop services in terms of quality and efficiency.

The Silk Road, a hymn of friendship

"ZPMC is a responsible company full of love. They have proved its responsibility with practical actions and spread positive energy. This project will be another bridge to boost China-Panama friendship," said the person in charge of the local public welfare organization at the completion and handover ceremony for the solar panel facility provided by ZPMC for an orphanage in Panama.

Friendship goes beyond national boundaries. By taking the Silk Road again, ZPMC's people seized overseas development opportunities and actively participated in the Belt and Road cooperation, deeply practiced the "people-oriented" concept, took overseas projects and local agencies as a bridge to actively fulfill ZPMC's social responsibilities and promote multicultural exchanges, and composed hymns of the Belt and Road cooperation in countries involving the initiative.

Apart from providing photovoltaic power station for the orphanage in Panama, ZPMC Indo-Australian Regional Center-Sri Lankan subsidiary held a public open day with the theme of "Small schoolbags, Great Love, Celebrating Lanka New Year and Building the Belt and Road Initiative Together". At the event site, the responsible person of ZPMC's Sri Lankan subsidiary donated schoolbags to the children of the local employees and spread Chinese culture to them. The children expressed their desire to visit China and work at enterprises in China when they grow up. ZPMC sowed the seed of friendship in foreign children's hearts through the warm-hearted project.

In addition, ZPMC takes overseas projects as the lever, helps local economic and social development, builds a stage for young people to display their talents and realize their dreams.

Pathmika Jayasingha is a local employee of the ZPMC's Sri Lankan subsidiary and joined the family of ZPMC after he graduated in 2014. Under the guidance of his master Zhang Zhiyong from China, Pathmika Jayasingha quickly grew into an excellent electrical engineer. From Sri Lanka to Pakistan, the master and the apprentice solved one technical problem after another with their excellent skills, and Pathmika Jayasingha was selected as one of "Top Ten Foreign Young Employees of CCCC in 2018-2019".

Dartfield is a local worker recruited by ZPMC during the construction of Maputo Bay Bridge in Mozambique. After months of careful learning at the project department, he grew from an apprentice to a skilled local team leader. After the completion of Maputo Bay Bridge, more than 5,000 local skilled workers, such as Dartfield, trained during the construction of the bridge, joined in the local industries, driving more people to create a happy and beautiful life with their efforts.

In 2023, ZPMC provided 10 STS cranes for Jeddah Port in Saudi Arabia, attracting many women to work as remote control drivers



The 22nd "Chinese Bridge" World University Chinese Language Competition South Africa Final & ZPMC Cup - Chinese Bridge South African University Student Chinese Language Competition



ZPMC German subsidiary donates books to German Hanhua Chinesisch-Schule

of automated STS cranes. Automated STS cranes not only improve the working environment and work efficiency, but also upgrade the working concept and emancipate the mind. The traditional impressions that "women are not suitable for operating STS cranes" is gradually being broken. The cooperation between ZPMC and Jeddah Port and Dammam Port in Saudi Arabia has actively contributed to improving the female employment rate of in Saudi Arabia, and ZPMC used its wisdom to help local women achieve their dreams.

ZPMC, as one of the earliest equipment manufacturing enterprises in China, has shown a new momentum of vigorous development in practicing the Belt and Road Initiative. In the future, ZPMC will continue to implement its innovative concept and internationalization strategy, and promote the "hard connectivity" between infrastructure, "soft connectivity" between rules and standards, and "heart connectivity" between the people's sentiments, so as to inject more vitality into the sustainable development of the Belt and Road Initiative. 振

(Photo by relevant units)

Remeet at Port Said

by Lu Yiyan

Siren sounds in desert. The Suez Canal, known as the "Great Waterway of the East, flows effortlessly along its banks, with lucid water reflecting the azure sky. Seagulls, with their wings spread, often glide over the canal. Sometimes they soar up in the sky; sometimes they dart over huge ships. As a shipping artery connecting Europe, Asia and Africa, the Suez Canal allows about 18,000 ships from more than 100 countries and regions passing every year.



SCCT of Port Said

Port Said is situated at the northern end of the Suez Canal. As a crucial port city in Egypt, it serves as a gateway of the canal. Port Said is divided into two districts, the east district and the west district. The east district, namely Suez Canal Container Terminal (SCCT), was opened in October 2004, and 50% of Egypt's container transportation was completed here. After participating in the Belt and Road Initiative, Port Said has developed rapidly, with container throughput growing steadily. With advanced equipment, superior geographical location and efficient container handling capacity, Port Said has become one of the most outstanding hubs in the world and the Mediterranean region.

In a summer seven years ago, when ZPMC completed the delivery of STS crane project for SCCT, the terminal user sent a thank-you letter, saying in the end: "We hope that we can meet again for the future project of SCCT at Port Said." After that, the terminal purchased a batch of 10 RTG cranes from ZPMC. In order to further improve the equipment and capacity of the terminal, the terminal user started to upgrade the SCCT at Port Said in 2020. The most important part of the upgrading was that the terminal would add berths and purchase more port equipment, including 12 STS cranes and 30 RTG cranes.

Wang Qian of ZPMC acted as the business manager in charge of docking with the terminal user. "Thanks to the long-term cooperative relationship, we learned about the planning and deployment of the user, and immediately followed up it when the project owner invited bidding last autumn." Due to the large number of equipment and large amount of investment, the project has attracted a lot of competitors with great strength. "Our products are highly reliable. Especially for 3E-type STS cranes, we have rich production experience and complete maintenance services." During the communication process, the user was satisfied with the leading product quality of ZPMC, but they still had doubts about some technical solutions, so they were indecisive.

"In order to win the order smoothly and showcase our strength and sincerity to the user, we held more than ten online meetings with the user, optimized the design scheme, answered the user's technical questions one by one, and persuaded the user to adopt the electronic control system independently developed by ZPMC. In addition, we also sorted out various potential problems under the contract in advance. For example, the special location of SCCT and inconvenient transportation will affect the efficiency of on-site delivery." Wang Qian added, "the user was deeply moved by our carefulness, because we gave early warning of various possible problems, and both sides could find ways to overcome difficulties together." In the end, the contract of 12 STS cranes was signed at the beginning of this year.

Although the process of ZPMC's signing the order for the STS cranes was smooth, it was extremely tortuous for ZPMC to win the order for 30 RTG cranes. It took ZPMC about half a year to complete



Maersk COO Jack Craig and his party visit Nantong Maersk Test Machine Project

the whole process from bidding to finally winning the order. Lu Wenting, business manager in charge of the negotiation about the RTG cranes, recalled this experience and couldn't help sighed: "Because our quotation method was different from our competitors, we had to communicate a lot with the user and at the same time we focused on displaying the automation advantages of our products."

Although the automated RTG cranes produced by ZPMC have been put into use at many terminals around the world, the terminal user was very cautious and meticulous in making a decision for their first purchase of ZPMC's RTG products. Lu Wenting, together with her colleagues responsible for automated equipment, organized an online "small classroom" for the user to explain the know-how about the automated equipment solution of ZPMC in detail before bidding. During the period, they also docked with the automation team of the terminal user and invited them to ZPMC's Shanghai headquarters and the production base in Nantong, Jiangsu Province for on-the-spot explanation.

The automation solution was not just a "blueprint". According to Lu Wenting, ZPMC and the terminal user started an automated RTG crane test project last year, and after renovating an old machine, they added automated equipment and rearranged the electric control system for the machine to meet the requirements of automatic testing. "Next, the automation function of this project in Port Said will be tested on the machine in advance to ensure that our equipment can be put into use as soon as possible after being shipped to the terminal site." In this way, the "two-pronged" efforts helped ZPMC gained this hard-win order finally.

Nowadays, a new batch of equipment made by ZPMC is being manufactured in full swing at its two bases. It is believed that the terminal user will remeet ZPMC's products and team in the near future at Port Said. 📷

(Photo by Zhang Linfei)

"Chinese technology" solves a global difficulty

by Zhang Ting

|| ZPMC is surely a leader in the port machinery industry, and its equipment and engineering work helped the handling of bauxite at Kuantan Port in an efficient and environmentally friendly manner!" In July, the general manager of Kuantan Port praised ZPMC at a delivery ceremony and formally invited ZPMC to supply goods for the new port projects in next stage.

The unloading of bauxite equipment at Kuantan Port

Kuantan Port, located 25 kilometers north of Kuantan, Pahang, Malaysia, is an important gateway along the 21st Century Maritime Silk Road. In 2017, as the traditional handling process of bauxite exported from Kuantan Port caused serious pollution and had problems such as low efficiency and high cost, the local government once stopped the export, and strictly prohibited the use of trucks to unload bauxite directly to the dock for loading. In this context, Malaysian port user immediately went to China to start several rounds of investigation, hoping to find a general contractor of bulk cargo equipment with great strength and excellent solutions to integrate all the equipment and systems except civil engineering for the project.

"You know, the technology needed for the project was a world difficulty at that time." Mao Hongliang, deputy dean of the Mechanical Design Institute of ZPMC's Design & Research Institute, and chief engineer of the General Contracting Department of Smart Port, recalled: "The material properties of bauxite are extremely special. When its moisture content is high, it is easy to be sticky and block feeding channels, and when its moisture content is low, it is easy to cause dust pollution. The owner has searched for many companies across China, but they did not find a satisfactory partner." Facing the high standards and strict requirements of the user, ZPMC's project team did not shrink back. Instead, the team considered all aspects in a more detailed manner and made even fuller preparations when making the scheme. Finally, with the professional and comprehensive, considerate equipment contracting services and handling system solution, ZPMC won the favor of the user, and successfully signed its first overseas EPC contract of bulk cargo system.

Everything is difficult before it is easy. Although ZPMC has rich experience in building overseas equipment projects, the project department still encountered many difficulties and challenges in building its first overseas EPC project of bulk cargo system. Because there was no successful case of continuous handling of bauxite at home and abroad before the project, the first thing ZPMC faced was the design and tackling of the technological difficulty in handling bauxite, and the difficulty index was extremely high. "At that time, the schedule was tight and the task was heavy. Our R&D team worked overtime to search information, conduct experiments and demonstrate the design scheme," recalled Guo Liguan, a project technical development engineer. At the same time, ZPMC coordinated all resources and invited industry experts to discuss the feasibility of the scheme many times.

In the end, the project team completed all the designs

in just three months. After several rounds of review and demonstration, all the designs for the project were highly recognized by the user and a third-party reviewer in Malaysia. "Our equipment not only meets the system design ability required by the user, but also far exceeds the defined value stipulated in the contract in dealing with bauxite with high moisture content," sighed Hu Yiren, deputy manager of the project, when talking about the initial construction process of the project for Kuantan Port. The world difficulty of reclaiming and transporting bauxite continuously was solved.

A great way leads to a distant destination, and the sea embraces all rivers. As a builder of port machinery and equipment, a supplier of high-quality system scheme for EPC projects and a provider of full-cycle service of equipment, ZPMC has always adhered to the principle of performing contract in a high-quality manner and worked hard on the Silk Road with its wisdom and sweat. The Belt and Road Initiative was first proposed by China, but it brings opportunities and achievements for the world. With the help of "Chinese Technology", the severe environmental pollution problem of Kuantan Port was solved, and the environmental-friendly equipment has improved the efficiency of dock operation and brought new brilliance to the port of the Silk Road in the new era.

In the sunshine, the dark green coastline of Kuantan Port shines brightly, and the theme of green development "ripples" on the sparkling sea surface. Seen from a distance, the bauxite handling equipment engraved with "ZPMC" nameplate, looks like a blue bridge across Kuantan Port, and it will witness more "intelligent manufacturing in China" to contribute wisdom and strength to jointly build the Belt and Road. 振

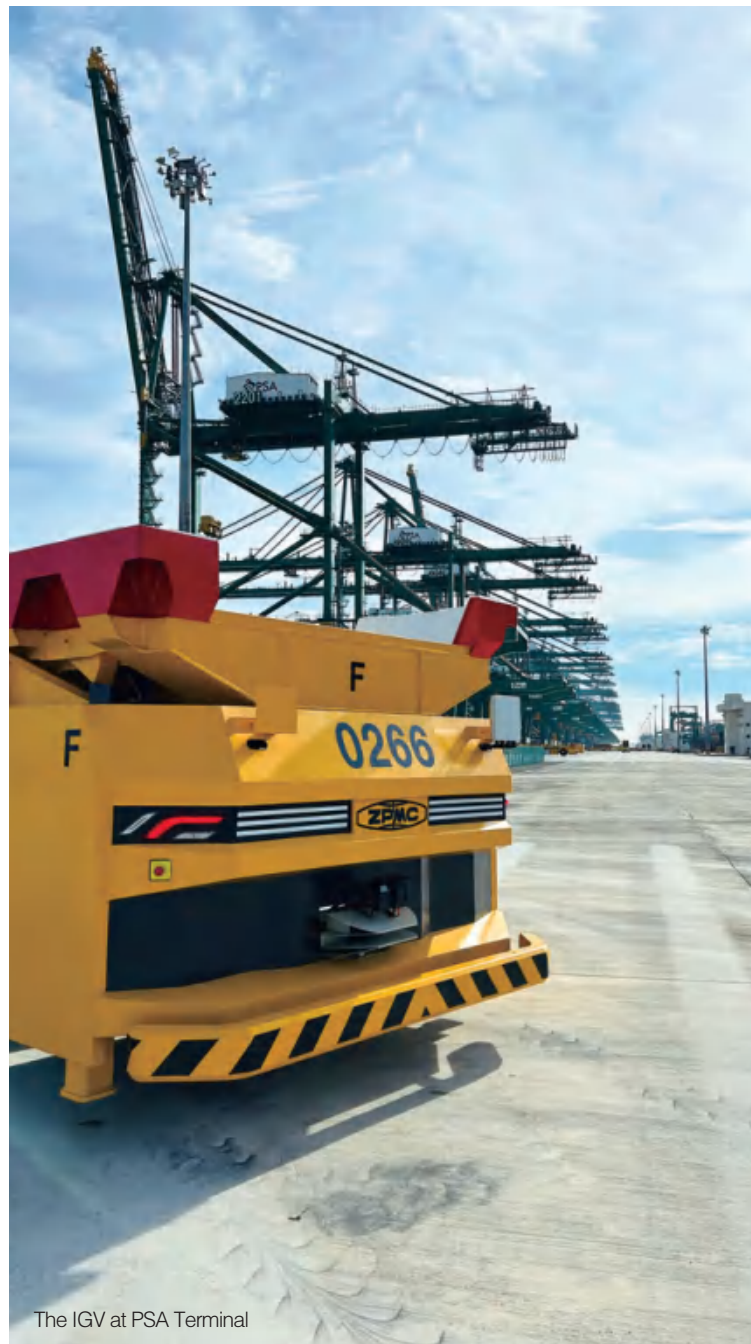
(Photo by Guo Liguan)



The general assembly of bauxite equipment at Kuantan Port

A breakthrough in "overseas manufacturing"

by Li Tianyi



The IGV at PSA Terminal

“There was nothing at the beginning, and we started from scratch,” said Yang Hao, general manager of the Asia Regional Center, when recalling his search for an equipment plant in the very beginning. Now, walking into the large-scale workshop in Seremban, Negeri Sembilan, Malaysia, the project of 46 AGVs are being manufactured in full swing, and recently two finished AGVs have arrived at the PSA terminal in Singapore by taking a “special vehicle”. This is the first time that ZPMC has completed the equipment manufacturing in an overseas plant, marking the first step of ZPMC’s key step to transform from “internationalized business” to “internationalized company”.

In 2022, in the period of COVID-19 and at the critical moment of the bidding of PSA project, the user proposed that “they would give priority to a supplier who can produce products in Singapore or in surrounding areas,” said Hu Wenhui, mechanical engineer of ZPMC’s Design & Research Institute.

Taking this as an opportunity, ZPMC began to explore the possibility of manufacturing overseas. At that time, it was imperative for ZPMC to understand the local business environment. According to the World Bank’s Doing Business 2020, Malaysia’s business environment ranks 12th among 190 economies in the world, second only to Singapore in the ASEAN region. In order to encourage foreign and domestic enterprises to invest in the field of equipment manufacturing, the Malaysian government has provided a package of policies to support equipment manufacturing Industry in terms of legal and tax. It is worth mentioning that compared with other port machinery and equipment, there are sufficient conditions for manufacturing AGVs at abroad. As AGV features small volume, simple structure and high standardization, its manufacturing



The delivery ceremony of the first batch of AGV for PSA Terminal

has less dependence on resources in the construction process and faces lower risk of major technical changes; moreover, when AGV is produced in the area around the user’s terminal, the delivery can be completed by land.

Therefore, the Asia Regional Center, the Marketing Headquarters and the Design and Research Institute of ZPMC immediately set up a working team to investigate five plants in Malaysia and Singapore. After a three-month investigation, the working team agreed that a Malaysian plant has strong advantages in steel structure production, assembly site and labor cost, so it is most suitable for ZPMC’s first attempt of “overseas manufacturing”.

However, the three plants in Malaysia had no machine tools, so it is impossible for them to process large structural parts such as the main frame of AGV. The suppliers of structural parts proposed different machining schemes, but after several rounds of communication, they still can’t meet the accuracy standard.

Over the next two months, Yang Hao led the team of the Asian Regional Center for in-depth investigation, and finally found a mature plant with machine tools. After everything was ready, the working team immediately wrote a detailed feasibility report, and ZPMC decided to start a pilot project of localized manufacturing in Malaysia. Shen Qiuyuan, vice president of ZPMC, personally led a team to investigate the plant. A plant with qualified steel structure production capacity and machining capacity was the first choice of ZPMC.

“The first step to achieve ‘overseas manufacturing’ relied on

the joint efforts.” sighed Yang Hao, when recalling the process from contract signing to product delivery in the past year. “The Operation Management Department, the Production Control Headquarters, the Marketing Headquarters and SPMP all provided strong support for our project,” he added.

In the plant in Malaysia, there are frequent scenes in which a group of people gather in a circle to discuss questions enthusiastically. The electrical, mechanical and hydraulic engineers from ZPMC’s Design and Research Institute patiently guide the local workers. “This is my first time to install AGV, and I feel it is very novel and I have learned a lot,” said Sam, a local worker. With the shipment of the first two AGVs, ZPMC’s exploration of “overseas manufacturing” is becoming a reality. 振

(Photo by Hu wenhui)



IGV

A bridge of friendship built with African partners

by Yang Rong

Maputo–Catembe Bridge in Mozambique

In Maputo, the capital of the African Republic of Mozambique, sits the Maputo Bay Bridge, which is a suspension bridge with a main span of 680 meters. Today, the bridge has become a local landmark and also a shining business card of ZPMC in practicing the Belt and Road cooperation.

Five years ago, the 100,000-ton "Zhenhua 24" loaded with the steel box girder of Maputo · Katembe Bridge, the largest suspension bridge in Africa, slowly docked at the port of Maputo. This cargo vessel from China carried the dream of local residents of Maputo to break traffic restrictions and live a better life.

Maputo Bay Bridge, spanning over Maputo Bay, Mozambique, is one of the cooperative projects under the Belt and Road cooperation. ZPMC built the steel structure of the main bridge, with a total weight of about 8,100 tons. This is also the first overseas steel bridge construction project undertaken by ZPMC.

Maputo, the capital of Mozambique, is divided into the south part and the north part by the Maputo Bay. Maputo city on the north bank has developed into a central city with millions of people. However, the Katembe area on the south

bank develops slowly due to traffic restrictions, and it is not rare for a family to squeeze into a thatched cottage. That was the environment where the local young man Dartfield lived.

In October 2017, 7 managers and 51 construction workers of ZPMC traveled across the oceans to Maputo, and the on-site construction process of the bridge started officially. According to the plan, the project department would hire dozens of local people to supplement the construction team. After being introduced by someone, Dartfield came to apply for an employment opportunity and finally became a polisher of ZPMC's team.

When he first joined the project department, Dartfield kept his original living habits, so he often missed the shift meeting in the morning. Deputy project manager Tao Lin, aware of the cultural differences in different regions, took Dartfield with him so that he could understand how Chinese workers work.

"Look at the roughening process of the top coat on the outer surface of the box girder. If the roughening is shallow, it cannot meet the quality requirements and cannot pass the inspection, but if it is too deep, the loss of the top coat increases and the cost is high." Listening to Tao Lin's detailed description of the process that is easy to be ignored, Dartfield

was full of admiration and yearning for learning the bridge-building skills of Chinese workers. Then he blurted out: "May I learn the skills?" Looking at the surprised and eager expression of Dartfield, Tao Lin replied with a smile: "As long as you are willing to learn, we will teach you."

Influenced by Chinese workers' hard-working and down-to-earth spirit, Dartfield settled down to work. A few months later, due to his excellent skills, he was promoted from an apprentice to a shift leader of local employees, and his salary was tripled. After mastering the techniques, Dartfield's income increases, his life has been improved, and he works in high spirits every day.

The project department hired nearly 100 people like Dartfield during the peak period of the project construction. In order to make friends with the local people rapidly, all the staff of the project department worked hard to learn Portuguese, a local common language, and they could communicate with the local people in just a few days. After achieving basic communication, the project department continued to organize skills training to help the local employees adapt to their jobs quickly. In daily life, the project department focused on the employees in need, and invited them to have lunch together, so

that ZPMC's "people-oriented" corporate culture could take root at the project site in Africa.

The project team's meticulous care and assistance made all local employees feel respected and kindly treated. The bridging of Maputo Bay Bridge project fell in the hot and humid rainy season in Mozambique. The workers often stopped to take shelter from the rain during their work. After several times, all workers became accustomed to it. Once it stopped raining, the workers started construction at the site immediately with noises rising here and there. On the bridge deck, whether it was a Chinese worker or an African worker, everyone had only one goal in mind: to erect the bridge as soon as possible.

Since the first steel box girder was erected in early October, it took only 25 days to close the bridge smoothly. The "Chinese Speed" amazed the local people. On the way back to the dormitory from the site, the members of the project department often met local residents, who thumbed up to express their "praise".

Time flies. Nearly five years after the bridge was opened to traffic, the Belt and Road cooperation has yielded fruitful results in Mozambique. This Sino-Africa friendship bridge not only connects Maputo with the bordering port of South Africa and the tourist resort of Mozambique "Ponta de Ouro" together, but also becomes the main road of land transportation running through the north and south, and also incites the local economy by virtue of the "strength of the bridge". Nowadays, there are many new buildings in the previous barren area of Katembe, which has integrated with Maputo city. In the booming scene, more than 5,000 local skilled workers, such as Dartfield, trained during the construction of the bridge, joined in the local industries, driving more people to create a happy and beautiful life with their efforts. 🌟

(Photo by Zhu Cong)



A group photo of the members of the project department and local employees

Light of hope "lights up" Panama

by **Xue Wenyuan**



The completion and ribbon-cutting ceremony for the photovoltaic power station built by ZPMC for Providence House in Colón, Panama



Rotary Club, an international non-profit organization, awarded ZPMC with the 2023 Outstanding Sponsor Gold Award and the Gold Award for PV Energy System Project

In August, Panama was still shrouded in heat, and the completion and ribbon-cutting ceremony was held for the photovoltaic power station built by ZPMC for Providence House (a non-profit orphanage) in Colón in Panama.

Providence House is the first orphanage in Panama to adopt children with special needs, aiming to provide care, nutrition, medical care and education for them and to improve their life

and help them to live a normal life. With the increase in the number of children in the orphanage, electricity consumption has surged, leading to escalating costs and financial strain for the organization. Rotary club, one of the world's largest public welfare organizations, initiated a photovoltaic power station project to meet the energy demand.

"Actively taking social responsibility has always been a fine tradition of ZPMC. Although we came to operate overseas, we can't lose this tradition," said Qian Weiyong, head of ZPMC Latin America Regional Center. "When Nancy Andrade Castro, president of Rotary Club Pacific (Panama City) and vice president of MIT invited us, we immediately decided to contribute our strength to this project, which is very beneficial to the local people."

In 2016, ZPMC entered the field of photovoltaic power generation, providing customers with one-stop solutions such as evaluation, design, implementation and operation of photovoltaic power generation systems, and has achieved good results. Over the years, ZPMC has invested and built 31 projects with a total installed capacity of nearly 100 MW. By the end of December 2022, these projects have generated 266 million kWh of green electricity in total, and ZPMC invested in and operated more than 2,200 power stations. "It happens that ZPMC has photovoltaic business, and we can donate our own photovoltaic power station for the orphanage, which also represents the sincerity of our company," said Qian Weiyong. "In a sense, this is the first time that ZPMC's photovoltaic products entered Panama."

After making the decision, ZPMC Latin America Regional Center immediately consulted MIT and decided that ZPMC would provide photovoltaic panels and MIT would be responsible for the project construction. MIT, the Manzanillo International Terminal, is located at the Atlantic entrance of the Panama Canal, close to Colón Free Zone, and is a good partner of ZPMC Latin America Regional Center. After the plan was reviewed by ZPMC, Qian Weiyong immediately sent the order back to China. After receiving the order, ZPMC prepared the products and shipped them to Panama as soon as possible. The photovoltaic power station, symbolizing the "light of hope", began to travel across the ocean to Panama.

The ribbon-cutting ceremony for the completion of the project was held in the carport of the courtyard of Providence House. The carport top is installed with the photovoltaic panels donated by ZPMC Latin America Regional Center. Behind the carport are tall and dense palm trees, cedars and rubber trees, forming a natural green background. The total installed capacity of this power station is about 60 kW and it consists of 108 photovoltaic modules. The photovoltaic power generation system of the power station, featuring ultra-high power double-sided, double-glazed PV modules for solar energy collection. After put into operation, the average annual power generation of the station is about 84,000 kWh, which can save about 28 tons of standard coal and reduce carbon dioxide emissions by about 78 tons per year.

In addition to the main persons in charge of the project, three children also attended the ribbon-cutting ceremony. They were children adopted by Providence House. During the ceremony, one of them helped to hold the blue ribbon, one carefully held the right hand of Matt Hedspeth, the founder of Providence House, and another child was lying in a huge black wheelchair due to his physical conditions, but he still

put his active toes on the back of Matt Hedspeth's left hand to celebrate the ceremony in his own way. "Seeing the smiles on the faces of these children, I sincerely feel that it is worthwhile for us to help them," Qian Weiyong said.

Matt Hedspeth said: "Our house has adopted dozens of children with special needs, and some of them need special medical equipment for rehabilitation exercise, which consumes a lot of electricity. We are very grateful to ZPMC for donating us the photovoltaic power station, which solved our electricity demand in time. Now more children can be treated. We thank our Chinese friends very much."

After the handover of the project, Rotary Club, an international non-profit organization, awarded ZPMC with the 2023 Outstanding Sponsor Gold Award and the Gold Award for PV Energy System Project.

Nancy Andrade Castro said: "ZPMC is a responsible company full of love. They have proved its responsibility with practical actions and spread positive energy. This project will be another bridge to boost China-Panama friendship." 据

(Photo by Qian Weiyong)

Carport top photovoltaic power station



How to **make steel bridges** by following high quality requirements?

by Zhou Wei

Bridges are important to society for a variety of reasons. They provide a means of transportation to break geographical restrictions, connect different regions and promote social and economic development. There is a long history of bridge construction in the world. With the development of science and technology, the materials and methods of bridge construction are constantly upgraded, and steel bridges have become the advanced representative of bridge construction technology today and the important development direction.

Since the construction of San Francisco-Oakland New Bay Bridge in the United States, ZPMC has deeply explored the steel bridge market for many years, and operates its bridge construction business in dozens of countries and regions, such as Asia, Europe, America, Australia and Africa. At the same time, ZPMC ranks first in the domestic steel bridge market. Then, as for the construction of steel bridges, what efforts should we do to meet the requirements of high-quality development?



What are the advantages of steel bridge?

With the rapid development of economy and the acceleration of urbanization, there are more and more demand for bridges in society. Steel structure bridge (or steel bridge), as a kind of bridge with high strength and durability, has increasingly been adopted for building large bridges and special bridge projects, and has become an important part of bridge construction.

Compared with traditional concrete bridges, steel bridges have many advantages. First of all, steel members of steel bridges feature small cross section, light weight and high strength, which are suitable for building bridges with heavy loads and are convenient for transportation and hoisting. Secondly, steel has good plasticity and toughness, and steel bridges have better seismic performance and wind resistance. Finally, the processing of steel structure is simple and rapid, the construction area is small, and some parts can be made on site. The installation of steel bridges is easy, the construction period is short, and the installation mode of steel bridge and the high precision of steel members make the quality of steel bridge stable. Moreover, steel bridge is also easy to be reinforced, heightened and widened during use.

In recent years, the Ministry of Transport has also issued a series of policies to promote the development of steel bridge industry in China. In 2016, the Ministry of Transport issued Guiding Opinions on Promoting the Construction of Highway Steel Bridges. The article points out that vigorously promoting the transformation and upgrading of highways, improve the quality of highway bridges and give full play to the advantages of steel bridges. In 2017, it issued the Notice on the Construction of Typical Demonstration Projects of Highway Steel Structure Bridges (the "Notice"), clearly proposing the construction of typical demonstration projects of highway steel structure bridges. The Notice requires that steel structure bridges should be built in accordance with the requirements of "industrial manufacturing and assembly-type construction", the construction organization and quality control management methods should be improved, and BIM (Building Information Model) and other technical means should be actively used to improve quality management; at the same time, it is necessary to scientifically choose the bridge structure type and strengthen the structural design of steel structure components. With the support of national policies, China has sped up to enter the "steel bridge era".



Nansha Bridge



Haiwen Bridge



What are the pain points of the steel bridge industry?

China's steel bridge industry is developing rapidly. AT the same time, the difficulties and pain points of the industry have emerged increasingly. Firstly, the market competition aggravates. A large number of standard steel bridges have been built, but more and more bridges with complex structures or harsh bridge sites across rivers, seas and valleys have emerged. The competition in the steel bridge market is extremely fierce, especially in large-scale engineering projects, where enterprises compete for orders and price wars are common. Secondly, there is the demand of technological innovation. With the progress of science and technology and the development of engineering technology, the steel bridge industry is facing the demand of improving technical level constantly. Innovative technologies such as new materials, advanced technology, digitalization and intelligence are constantly emerging, bringing challenges to

the traditional steel bridge industry. Thirdly, there is the lack of professionals. The steel bridge industry needs professionals with know-how and high skills, including designers, engineers, technicians and skilled construction workers. However, at present there is shortage of talents, especially the lack of senior technical talents, imposing restrictions on the development and technological progress of the steel bridge industry. Finally, there is the conflict between quality requirements and product prices. Steel bridge is a long-lasting project for the benefit of people's livelihood, so it requires extremely high quality. However, the market competition drives product prices to gradually decline. This requires steel bridge manufacturers to reduce construction costs, improve production efficiency and make technological innovations, so as to meet the increasingly high quality requirements of steel bridge manufacturing.



Facing the new situation, how can we build high quality bridges?

In the development process of steel bridge construction technology, with the research and application of new materials, new equipment and new processes, the steel bridge industry continuously proposes higher requirements in terms of manufacturing technology, production efficiency and quality control.

The key to building high-quality steel bridges is to vigorously develop BIM technology in steel bridge construction. The development of BIM (building information model) technology brings all stakeholders unlimited development possibilities for the design, construction, operation and maintenance of steel bridges, and it has a very broad application space. Steel bridge manufacturers need to apply BIM technology to build a cloud-based collaborative manufacturing platform for project management. Based on the 3D Tekla model, manufacturers study material management system, 3D machining integration technology, weld information management system, virtual pre-assembly technology and production material management system to integrate and share information such as process allowance, weld seam, product progress, product measurement inspection, tracking inventory on the steel structure BIM production information platform.

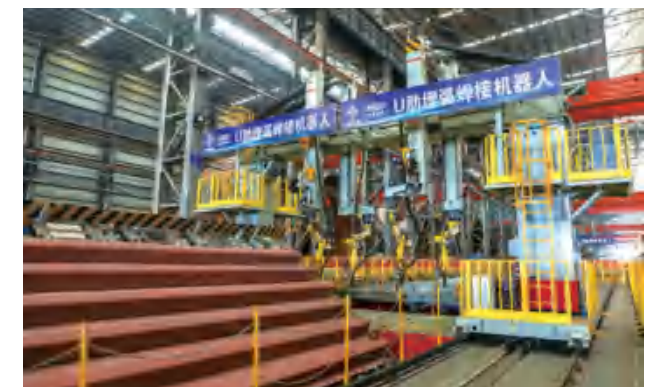
The focus of building high-quality steel bridges lies in the intellectualization of steel bridge manufacturing equipment. With the implementation of China's national strategy of "Made in China 2025", intelligent manufacturing, as one of the important aspects of the strategy, has attracted attention of various industries. Bridge steel structure features large size members, changeable structures, high quality requirements, complex production environment, which causes certain difficulties in production and manufacturing. Steel bridge manufacturers need to build "four lines and one system", namely intelligent planking & cutting production line, intelligent welding production line for plate units, intelligent assembly production line for segments, intelligent painting production line for steel box girders, and intelligent management and control system for workshop manufacturing implementation. With the research and application of robot welding production line, more than 90% plate units of steel box girder bridges have been manufactured with automatic welding. In addition, it is necessary to further improve the technology of planking and cutting of steel plates and plate unit welding technology and vigorously promote the non-destructive assembly technology of steel box girder segments, segment auto welding technology and

intelligent coating production line.

The only way to build high-quality steel bridges is applying innovative steel bridge welding technology. Firstly, it is necessary to apply the U-rib full penetration welding technology. The structural diseases of orthotropic steel bridge decks are common at home and abroad, which is a worldwide difficulty, and the crack of U-rib weld is the first crack source of orthotropic steel bridge decks. Steel bridge manufacturers can realize the submerged arc welding with flat filament on the inner sides of U-ribs by transforming U-rib welding carbon dioxide protection equipment. As for the outer sides of U-ribs, manufacturers can adopt submerged arc welding with thick filament at the ship's position and equip laser tracking, which greatly ensures the inspection qualification rate of full penetration weld, and forms a full penetration weld with high strength, good toughness and guaranteed performance, thus realizing full penetration welding of U-rib fillet weld and improving the anti-fatigue life of steel bridges. In addition, manufacturers can use innovative welding methods, such as using plasma gas technology to remove weld residue, using laser welding technology for thin plate welding and using submerged arc transverse welding technology on steel towers, which will greatly improve the quality of steel bridges and prolong their service life.

China will accelerate the high-quality development of the steel bridge industry relying on the construction of major projects such as large-scale cross-sea passages and gradually realize the "economic, green and sustainable" development of the steel bridge industry. 据

(Photo by Xu Jinxing)



U-rib submerged arc welding robot

A "Think-tank" for the operation of

by Li Tianyi

When it comes to "think tank", everyone will think of words such as resourcefulness and strategizing. Nowadays, Qinzhou Automated Terminal in Guangxi also ushers in a "think tank" – the IOC (intelligent operation and maintenance center).

"This is the first application of IOC in the port industry. The IOC integrates the data of different suppliers and various automation subsystems and connects 'data islands' together and realizes the active operation and maintenance of the terminal," said Guo Haowei, information manager of Qinzhou Automated Terminal, at the project site in August.

After put into operation, the terminal has accumulated geometrically increased data. Without a unified multi-dimensional data management and analysis system, the terminal user cannot make use of the large amount of data

effectively, and cannot quickly locate the fault problems. Instead, the user can only analyze and eliminate the problems by collecting data from different systems, and it usually takes hours or even days to identify the source of the problems. This has always been a pain point of terminal management.

Nowadays, ZPMC has independently developed the terminal operation "think tank" by integrating equipment control system, terminal operating system, dispatching system, stand-alone equipment, terminal logs and third-party data together, and has developed the IOC port wisdom brain large screen focusing on business decisions, operation commanding, and operation monitoring for users. Relying on big data processing, AI, 3D digital twinning, CCTV and other technologies, the IOC can achieve panoramic monitoring, real-time feedback of tide information, overview of landside

Qinzhou Automated Terminal

information, terminal throughput and shift efficiency, so as to realize synchronous "visualization" of video and data. "The user's top management can see the month-on-month data comparisons of the terminal, the efficiency data of the same day, etc., monitor and gain insight into the overall operational indicators, and make decisions rapidly," Guo Haowei said.

Not only that, the "think tank" is more like a meticulous "doctor", who can deeply diagnose various "sub-health" problems of equipment, systems and servers, check the "physical examination reports" of the servers in the past six hours, and provide targeted "treatment methods". "The main machine room is closely connected with the servers of the three major equipment systems. Once any equipment fails, a small red bell warning sign will appear on the screen, and the failure and recommended treatment plan will be sent to the user's mobile

phone or computer, so that the user can make a quick decision immediately," explained Yuan Hao, software engineer of ZPMC.

In addition, the smart big screen of the intelligent brain of the IOC can also show a panoramic view of the terminal. IGVs are shuttling back and forth in the container yard, STS cranes are operating efficiently to handling vessels. The busy scene is vividly displayed on the screen as what you see at the terminal site.

It is worth mentioning that the IOC can not only grasp the operation status of the whole terminal, but also provide a secondary development platform. Therefore, users can expand their functions according to the business of their terminals, further promote the update of the "think tank", and escort the safe and efficient production of Qinzhou Automated Terminal of Beibu Gulf Port with wisdom strength. 据

(Photo by Lu Zhidong)

The IOC of Beibu Gulf Port Qinzhou Terminal



A small fellow lifts thousand tons

by **Zhang Jie and Zhao Ying**

“These two 'great maritime tools' were independently developed and designed by China, and the core and supporting components are fully localized.” On September 19th, the reporter from CCTV walked into the ZPMC Qidong Marine Engineering Co., Ltd. to make on-the-site report on the delivery ceremony of two sets of domestic first-class and internationally leading new-generation offshore wind power construction equipment.

The "great maritime tools" mentioned by the reporter are the 2500-ton Haifeng 1001 and 1800-ton Haifeng 1002 self-propelled jack-up wind power installation platforms designed and built by ZPMC and invested by CCCC Haifeng Wind Power Development Co., Ltd. The cranes arranged on the top of the platforms are new type pile-winding design, making "Haifeng 1001" a wind power installation platform with the largest lifting capacity, the highest lifting height and the lightest self-weight in China.



The 2,500-ton self-propelled self-elevating wind power installation platform "Haifeng 1001"

The new generation of super-large leg-winding offshore platform crane was developed by ZPMC Yan Bing Floating Crane Innovation Studio. "This model has set a new record for the performance index of offshore wind power installation crane independently developed in China. We have independent intellectual property rights of the platform and its technology has reached the international leading level," said Yan Bing, deputy chief engineer of ZPMC and chief engineer of ZPMC's Design and Research Institute.

With the "blowout" development of the global wind power market, the large-scale and deep-water offshore wind turbines need new offshore wind power installation platforms with higher lifting capacities. As a result, to build the platforms with more streamlined deck space and light overall weight has become a trend. So the concept of "leg-winding" came into being. This design is to make the crane "wind" around the legs, which act as pillars, saving the space and weight occupied by the original pillars of the crane.

It is not easy to realize this design concept. As the leader of "Yan Bing Floating Crane Innovation Studio", Yan Bing led the innovation studio to actively seize market opportunities and focus on developing new models. "It is a great challenge for R&D personnel to realize the crane's large lifting capacity, high lifting height, low energy consumption and light self-weight to meet a variety of deep sea conditions," said Lu Kai, member of the innovation studio and chief of the new model mechanical design department.

The first problem faced by the innovation studio was how to arrange more than 10 large winches and electrical rooms on the slewing chassis with the crane tail diameter of less than 20 meters. The layout of foreign leg-winding cranes is that the legs directly pass through the chassis. In this design, the legs and truss frame alone occupy most of the chassis space, and the layout of winches and electrical room is cramped, so it is difficult to reduce the overall weight." Lu Kai analyzed. Without any reference, the studio directly simplified the combination of truss frame and herringbone frame as the support type herringbone frame, which saves most of the structure of truss frame, greatly reduces the structure, and reduces the weight by over 10% compared to that of traditional models.

The second difficult problem is the R&D of crane boom. The boom length is more than 150 meters, and it is difficult to meet the requirements of large tonnage lifting and towing safety only by reducing the design allowance. According to the different stress conditions, the studio adopted different sections and materials from the root to the head of the boom, strengthened the key parts, and reduced the weight of the secondary parts as appropriate, and used high-strength steel plates as the main rod, which reduced the weight of the boom by about 5% while ensuring the strength and stiffness of the boom.

By constantly overcoming difficulties, the team also put forward innovative designs such as cantilever lock hook and

A new generation of super-large leg-winding offshore platform crane



active trolley hawser system, combined with the comprehensive optimization of electric control system, man-machine interaction system, whole-machine failure mode and impact analysis, which can meet the hoisting capacity of 15–20 MW wind power equipment and the construction under adverse working conditions.

As the representative of super-large lightweight wind power installation crane, ZPMC's self-developed new generation of super-large leg-winding crane has upgraded performance in all dimensions and can meet the development trend of high-efficiency, lightweight and intelligence of wind power installation platform. In addition to the two platforms recently delivered for CCCC Haifeng Wind Power, the new crane has also been applied to the wind power installation platforms such as 2000-ton Baihetan, 1600-ton Zhongtian 31, and 3500-ton Zhengli Haifa under construction.

In the future, ZPMC will continuously provide integrated solutions for offshore wind power installation platforms, such as hull, lifting system and electric control system and other services from design, construction to commissioning and delivery, which will provide strong support for improving the level of the offshore wind power equipment and realize clean energy development in China. 振

(Photo by Zhao Ying)

How was the domestic largest capacity offshore wind power installation vessel built?

by Li Tianyi and Gui Lin

On September 19th, a grand ceremony was held for the delivery of the 2500-ton wind power installation platform "Haifeng 1001" designed and built by ZPMC and invested by CCCC Haifeng Wind Power Development Co., Ltd. As the first fourth-generation offshore wind power installation platform with the largest lifting capacity of 2500 tons, "Haifeng 1001" will serve the offshore wind farms to carry out various wind power engineering operations, including the installation of towers, engine rooms and blades of 20 MW offshore wind turbines, the construction of wind turbine foundation, and other offshore hoisting operations or support, providing a "great tool" for China's offshore wind power industry to go to deep sea and realize the high-quality development of clean energy. "Haifeng 1001" has gathered the collective strength of the project team from the design, construction and delivery. Let's get close to the "Haifeng 1001" project team and understand the story behind this "great maritime tool".



The trial voyage of the 2,500-ton self-propelled self-elevating wind power installation platform "Haifeng 1001"



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Q1. What challenges did "Haifeng 1001" encounter and solve in the design process?

Li Junlin, Chief Engineer of "Haifeng 1001" Project:

As the first vessel, "Haifeng 1001" encountered many difficulties in the design process. The technical team provided technical support from the preliminary scheme discussion to design and drawing, and to the final completion and delivery.

It was extremely crucial to manufacture the slewing bearing, the core component of main crane. The design engineer worked together with the bearing manufacturer and decided to adopt the split three-row cylindrical roller slewing bearing, which reduced the manufacturing difficulty on the premise of meeting the design parameters.

The leg length of the platform is 120 meters. Under the conditions that the dead weight of the platform is nearly 27,000 tons, the crane is so heavy and the span is so large, the strength of the leg has to be much higher. Based on the design experience of drilling platform, the designer repeatedly calculated and optimized the scheme, and increased the diameter of semi-circular plate and adopted differentiated design without increasing the thickness of rack plate, thus effectively controlling the cost.

In addition, the leg flushing system plays a key role in pulling legs smoothly, especially in the sea area with deep mud. If the

legs cannot be pulled out in time, it will not only affect the construction efficiency, but even threaten the safety of the platform. The designer held several special discussions and model reviews around the selection and configuration of the leg-flushing pump, the design of the leg-flushing pipelines, and the number, arrangement and angle of nozzles, and listened to the owner's construction experience, finally maximized the leg-flushing effect with all branch pipes and nozzles detachable, which is convenient for the user to maintain them in the future.

Zhang Jiaqi, technical manager of "Haifeng 1001" project: The total construction period of this project was 20 months, and the design schedule was really tight. In mid-March, 2022, it was the peak time for the design team to draft drawings, but the engineers produced quality drawings as scheduled according to the requirements of the work nodes. They overcame difficulties such as the impact by the insufficient information, made use of ZPMC's strength of integrated design and production. For example, when the A version of the design drawing was sent to the shipowner and the Classification Society for review, it would be submitted to the base as a reference for production design at the same time.

After the shipowner and the Classification Society sent back the reviewed drawing, the base would fine-tune the production design according to the modified content of the drawing, thus saving time, and finally completed the project as planned.



The scenery in the trial voyage



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Q2. How can our company integrate resources and jointly promote the rigid performance of the project?



The commissioning team is commissioning and inspecting the winch in rain



The commissioning team is conducting carbon dioxide inspection in the engine room

Du Luobing, general planner of "Haifeng 1001" project: I think it can be attributed to rich experience, sufficient production capacity resources and a well-organized project team.

First of all, our company has rich experience in the design and construction of drilling platforms. We have independently developed "Zhenhai" series and trained excellent designers, technicians and project management teams. Secondly, we have sufficient production capacity resources. ZPMC has 6 bases for manufacturing heavy equipment and abundant production capacity resources for serial production. The hull, main crane, lifting frame and legs were made in different bases and the simultaneous advancement can save a lot of time. Thirdly, we have a well-organized project team. First of all, "ahead of schedule" is the key factor of the project. Early delivery must make plans in advance, especially for the control of key nodes. For example, the core components were synchronously manufactured with the lifting frame and the main hull, and it was completed before the hull. Secondly, our professional lifting system debugging team also carried out pre-debugging, so the erection of the legs of the platform was completed in only half a month after being launched from the shipyard. Finally, before the platform was in place, the team also pre-debugged the main crane. After the platform was put in place, the team spent three to five days to hoist the "three big pieces" of the crane, that is, the chassis, the herringbone frame and the boom frame, and completed the heavy load test for them within one week.

Liu Weiqiu, contact person of "Haifeng 1001" project coordination team: This project was designed by ZPMC's Design and Research Institute and manufactured by ZPMC Nantong and ZPMC Nantong Transmission, so there were a lot of coordination between different departments. In order to achieve efficient performance of the contract, our company cooperated with many parties to ensure the delivery nodes.

At the beginning of the project, our company set up a leading team, a coordination team and an implementation team for the project. The leading team held meetings with senior management of the user every quarter to promote rapid decision-making on different matters. The coordination team established a "biweekly meeting" mechanism to cooperate with all parties to implement the nodes. The project management department organized various practical work for the project and set up a weekly meeting system with the supervisor to solve the on-site problems in time. The three layers of organizations worked closely together to promote the whole-process management of the project systematically and efficiently.

The project contract was signed in January 2022, which coincided with the eve of the Spring Festival. After the Spring



The project members participated in the trial voyage of "Haifeng 1001"

Festival holidays, Shanghai was affected by the COVID-19, which brought great challenges to the design, material procurement negotiations and production preparation for the project. The coordination team worked with the production entities to hold the negotiations of material procurement online to save time.

In the fourth quarter of 2022, the production units were continuously affected by typhoons, power cuts and the COVID-19 pandemic. In order to ensure the node of "connecting the main hull" at the end of 2022, the project team fully mobilized the enthusiasm of subcontractors, set up a special plan to work against the schedule, and tried to achieve the node goals by increasing manpower and implementing the responsible-person system.

The implementation process of the project was not smooth as expected, but everyone always adhered to the concept that "there is a will, there is a way" and realized the early delivery of the project, which enhanced the good image of offshore engineering brand of ZPMC. The project team will continue

to sum up experience and extend it to the management practice of other projects to make contributions to the high-quality contract performance of ZPMC.



"Haifeng 1001" is undergoing a full-process lifting & lowering test



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Q3. How did the project team coordinate and ensure the platform was launched from shipyard as scheduled?

Zhou Lulin, deputy chief engineer of "Haifeng 1001" project: The platform has 4 legs and 12 groups of lifting frames, and each lifting frame weighs 130 tons. According to the previous project construction experience, the construction and loading cycle of lifting frames was very long, so it was key factor to decide whether the whole platform could be launched on schedule. In order to ensure the launching nodes of the platform, the project team planned and organized experts to discuss and study the scheme in advance, and finally decided to produce the lifting frames and the hull simultaneously. Twelve groups of lifting frames were pre-assembled and loaded within 40 days, which saved time for inserting the platform legs.

In addition, the water level in the shipyard had a great impact on the platform's undocking, and the platform may not get out of the yard even if there was a slight deviation. However, the tide table for reference is updated once a year, and this year's tide was much lower than the predicted value in the table, so we were worried that we could not launch the platform on time.

At that time, it was only three months before launching the platform. We referred to the tide table every day to survey and record the tide heights at the apron of the yard. We recorded more than 100 groups of data, compared and calculated them for many times, determined the difference between the numerical value of the tide table and the actual tide height, and predicated the time point of the highest tide level, which ensured that there would be enough tide on the day of undocking the platform and ensured the safety of its undocking.



The project team members are working overtime to make preparations for the trial voyage



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Q4.From June 6th, 2023 when the platform was launched to August 8th, 2023 when the platform set out for the sea trial, the time used was only half of the normal progress. How did the team do it?

Cai Weiyue, assembly debugging technician of "Haifeng 1001" project: The crane project department suddenly felt pressure after receiving the overall debugging and trial plan of the platform after launching. Usually, it is almost impossible to complete the crane assembly, wire rope threading, debugging and evidence collection within two months after launching, which will be a whole month earlier than those of the same type crane.

In order to shorten the construction period from three months to two months, the project department reversed the construction tasks according to the overall plan, sorted out the difficulties in the implementation of the plan, and moved the processes forward as far as possible. The first step was to complete the overspeed test of the winch mechanism and some wire rope threading work before the final assembly of crane, which saved about 15 days for the wire rope threading period. The second step was to sort out the procedures that may interfere with the crane's wire rope threading and debugging, and readjust the plan to reduce the impact of hull construction on the crane; In the third step, the project team optimized the no-load debugging and lifting test according to the characteristics of short debugging and evidence collection periods and heavy tasks, and made preparations for them in advance. prepared in advance. During the final lifting test, the crane debugging team, the hull power supply team and the owner's manufacturing supervision team worked together around the clock and finally completed the lifting test of the crane on August 4th. 图

(Photo by Xujinxing,Li Junlin,Li Meng and Zhou Lulin)