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YOFO TODAY

今日长飞

践行“中国制造2025”
推进工业转型升级

Practicing Plan of “Made in China 2025” and Promoting Industrial Transformation and Upgrading

双月刊

2016年12月 第5期 总第104期

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推进智能制造，助力产业转型升级

□ 本刊编辑部

随着云计算、大数据、物联网等新技术的飞速发展，美国、德国、英国、日本等国家相继推出国家级制造业发展战略规划，并不约而同提出要大力推进智能制造。

从我国来看，“中国制造2025”概念在2014年12月被首次提出；2015年3月，李克强总理在全国“两会”作政府工作报告时提出《中国制造2025》的宏大计划，智能制造已经成为全球制造业的竞争焦点。

为践行《中国制造2025》行动纲领，打造具有国际竞争力的企业，长飞公司积极推进智能制造，通过总体规划、技术迭代的模式，不断探索光纤光缆智能制造流程以及智能工厂的整体解决方案。尤为值得一提的是，长飞公司在2015年被工信部评选为首批智能制造试点示范企业，是光纤光缆行业，也是湖北省进入智能制造试点的唯一代表。

在持续推进核心装备智能化升级的同时，长飞公司还瞄准物流、包装等辅助制造环节，加大改进力度。目前，长飞公司已成立智能制造管理小组，进行了缠绕膜式光纤自动包装流水线开发，着力解决在无法接触的光纤表面进行包装以及使用机械手在复杂料架上进行堆放材料的问题。通过规划机械手最优路径、规避包装间隙等技术措施，长飞公司的光纤自动包装流水线有效解决了光纤包装难题。

此外，智能制造管理小组还定制了数字地图制导AGV（自动导向小车），绘制了整个车间的三维数字地图，在不对现有生产环境造成任何影响的情况下，实现了光纤大盘自动运输和存放，光纤物流可基本实现数字化监控。在信息系统升级方面，长飞公司引入了存储集群和云计算技术，形成信息集中管理系统，并行数据处理能力大幅提高，生产装备与信息系统不断交互融合，逐步由智能装备向智慧车间演进。长飞正在开发的云制造平台可通过信息系统，实现全球范围内各生产基地的数字化协同制造，将进一步提高集团的制造效率和质量。

智能制造试点企业和重大专项的申报成功，让长飞公司站在了更高的平台上。在提升自身智能制造水平的同时，长飞公司一直致力于推动行业整体进步。未来，在国家智能制造试点示范企业平台的基础上，长飞公司将进一步提升生产制造智能水平，加强与领先智能制造企业的合作，共同推动中国智能制造水平的提升。

Promoting Intelligent Manufacturing, Assisting Industrial Transformation and Upgrading

☐ The Editorial

With the rapid development of cloud computing, big data, internet of things and other new technologies, US, Germany, UK, Japan and other countries successively rolled out state-level development strategic plans and raised to vigorously promote intelligent manufacturing without previous arrangement.

In view of China, the concept of "Made in China 2025" strategy was firstly raised in December 2014, with the grand plan of "Made in China 2025" strategy put forward by Premier Li Keqiang at the government work report of the "NPC &CPPCC" sessions in March 2015, intelligent manufacturing has become a competitive focus of global manufacturing industry.

In order to fulfill the program of action of "Made in China 2025" strategy and to create a company of international competitiveness, YOFC has played an active role in promoting intelligent manufacturing and continuously explored the integrated solutions of intelligent manufacturing of optical Þbers and a smart factory through overall planning as well as the mode of technological iteration. It is worth mentioning that YOFC has been appraised as one of the Þrst batch intelligent manufacturing pilot demonstration enterprises confirmed by the Ministry of Industry and Information Technology in 2015 as well as the only representative enterprise of China's optical Þber and cable industry and of Hubei's intelligent manufacturing pilot.

While constantly promoting the intellectualized upgrading of its core equipment, YOFC has also aimed at such aided manufacturing links as logistics and packing in order to strengthen its improvement efforts. Currently, YOFC has set up an intelligent manufacturing management group, and developed stretch film type automatic packing flow line for optical fibers, thus solving the problems that packing cannot be realized on the out-of-reach surface of optical fibers and that materials are piled up on the complex rack shelf stack with manipulators. Packing difÞculties of optical Þbers can be solved effectively by such technical measures as planning the optimal route of manipulators and avoiding packing intervals.

Besides, the intelligent manufacturing management group has customized digital map guidance AGV (automated guided vehicle) and drawn the three-dimensional digital map of the whole workshop, thus realizing the automatic delivery and storage of optical Þber large plates in the case of not exerting any inßuences on the current production environment and basically realizing digital monitoring for the optical Þber logistics in the workshop. In terms of upgrading of information system, YOFC has introduced storage cluster and cloud computing technology, formed an information centralized management system, dramatically improved the processing capacity for parallel data, constantly integrated production equipment and information system and gradually evolved from intelligent equipment to smart workshop. YOFC has still been conducting its further development of the cloud manufacturing platform with the purpose of realizing the digital collaborative manufacturing of all production bases on a global scale through the information system, which will further improve the manufacturing efficiency and quality of the whole group.

Intelligent manufacturing pilot enterprise and the successful application of major projects have scaled YOFC to a new height. YOFC has been dedicated to promoting overall progress of the industry while improving its own intelligent manufacturing level. In the coming years, based on the platform of national intelligent manufacturing pilot demonstration enterprise, YOFC will further improve its intelligent production and manufacturing level, strengthen its cooperation with leading intelligent manufacturing enterprises and jointly enhance the intelligent manufacturing level in China.

首届世界光纤光缆大会绽放光谷

□ 本刊编辑部

2016年11月3～5日，由CRU（英国商品研究所）和长飞公司联合主办的首届世界光纤光缆大会在中国光谷隆重举行。继2015年亚太光纤光缆大会成功举办后，CRU首次将真正意义上的全球性光纤光缆会议成功“落地”中国。

全球性光纤光缆会议成功落地中国

本次会议汇集了全球范围的专家和精英，吸引了来自政府部门、电信运营商、设备商、行业组织以及研究机构的嘉宾与全球顶尖行业专家在内的600余位代表，聚集了长飞、烽火、富通、亨通、中天等为代表的中国行业顶尖企业，以及康宁、普睿司曼、信越、斯特雷德等为代表的美国、日本、欧洲、印度光纤光缆产业巨头。同时，大会还引起了投资机构的高度关注。

本次会议受到了湖北省、武汉市、东湖高新区等各级政府的高度重视，武汉市委副书记、武汉市市长万勇在大会上表示，他相信本次世界光纤光缆大会在中国光谷的召开，将会对整个行业产生深远的影响。

中国工程院院士邬贺铨在演讲中指出，宽带化为我国光通信技术的发展和应用提供了广阔空间，光纤光缆是宽带化的重要支撑。“宽带中国”战略为光纤光缆行业带来了巨大的机遇和挑战，产业链各环节要加大创新力度。

中国成为“四大中心”指日可待

2016世界光纤光缆大会主席、长飞公司总裁庄丹表示，近年来全球光纤光缆行业方兴未艾，“中国速度”更是引人注目。2016年全球约60%光缆产量来自于中国，长飞公司更是成长为全球第一大光纤预制棒及光纤供应商和全球第二大光缆供应商。

首届世界光纤光缆大会在中国武汉光谷举办，充分体现了中国光纤光缆产业国际话语权和影响力的提升。此次大会有利于中国光纤光缆厂商获取行业内的前沿信息，开拓国际市场，也将对我国建设“四大中心”——研发中心、制造中心、销售中心、咨询与服务中心起到积极推动作用。

广阔的市场需要创新的精神去开拓，更需要合作共赢，中国光纤光缆企业五大领军人物——长飞光纤光缆股份有限公司总裁庄丹、烽火通信科技股份有限公司总裁戈俊、富通集团总裁肖玮、亨通集团执行总裁钱建林、中天科技集团总裁薛驰展开了思想碰撞，共同探讨中国光纤光缆市场的发展现状和前景，推进全球光纤光缆行业的健康发展。

First World Optical Fibre & Cable Conference Successfully Held at Optics Valley of China

☐ The Editorial

On Nov. 3-5, 2016, CRU and Yangtze Optical Fibre and Cable Joint Stock Limited Company co-hosted the First World Optical Fibre & Cable Conference at Optics Valley of China. After successfully hosting APAC Optical Fibre & Cable Conference 2015, CRU truly makes the world optical Þbre & cable conference be successfully landed in China for the Þrst time.

World optical fibre & cable conference has been successfully landed in China.

On the Conference, experts and elites in the world were gathered. More than 600 guests and top industry experts from government departments, telecommunication operators, equipment suppliers, industry associations and research institutes were present. Top industrial enterprises from China such as Yangtze Optical Fibre and Cable Joint Stock Limited Company, Fiberhome Telecommunication Technologies Co., Ltd., FUTONG Group Co., Ltd., HENGTONG Group Co., Ltd. and ZTT Group and optical fibre & cable industry giants from America, Japan, Europe and India such as Corning, Prysmian Group, Shin-Etsu Chemical Co., Ltd. and Strayed Company attended the Conference. In addition, the Conference attracted high attention of investment organizations.

The Conference got high attention of government departments of various levels such as East Lake High-Tech Development Zone, Wuhan and Hubei Province. Wan Yong, the Deputy Secretary and Mayor of Wuhan expressed on the Conference that he believed the World Optical Fibre & Cable Conference held in Optics Valley of China would have profound inßuences on the entire industry.

Wu Hequan, academician of the Chinese Academy of Engineering, showed in his speech that "Broadbandization gives wide space for development and application of optical communication techniques in China and optical fibres & cables support broadbandization". "Broadband China" Strategy brings huge opportunities and challenges to the optical fibre & cable industry and the innovation strength for each link of the industry chain shall be improved.

China becoming "Four Centers" is just around the corner.

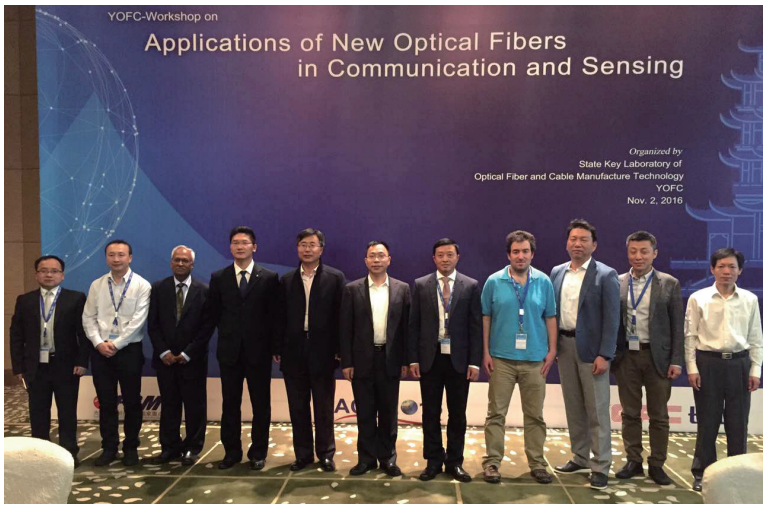
Zhuang Dan, the Chairman of World Optical Fibre & Cable Conference 2016 and President of Yangtze Optical Fibre and Cable Joint Stock Limited Company, showed that "the world optical Þbre & cable industry is still making progress in recent years and "Chinese Speed" catches our eyes". In 2016, about 60% cables in the world were from China. Yangtze Optical Fibre and Cable Joint Stock Limited Company becomes the largest supplier of optical fibre performs and cables and second largest cable supplier in the world.

Holding of the First World Optical Fibre & Cable Conference in Optics Valley of China in Wuhan fully reflects that the international discourse right and inßuence of Chinese optical Þbre & cable industry have been improved. The Conference is beneÞcial to optical Þbre & cable manufacturers of China to obtain the latest information of the industry and explore the international market and also promotes construction of "Four Centers" (R&D Center, Manufacturing Center, Sales Center and Consulting and Service Center) of China.

Innovation spirit and win-win cooperation is required to explore the broad market. Five leaders of Chinese optical fibre & cable enterprises (Zhuang Dan, the President of Yangtze Optical Fibre and Cable Joint Stock Limited Company; Ge Jun, the President of Fiberhome Telecommunication Technologies Co., Ltd.; Xiao Wei, the President of FUTONG Group Co., Ltd.; Qian Jianlin, the President of HENGTONG Group Co., Ltd; and Xue Chi, the President of ZTT Group) shared ideas and discussed on the development status and prospect of Chinese optical Þbre & cable market to promote healthy development of the world optical Þbre & cable industry.

长飞国重共襄ACP2016盛会
研究成果领跑全球同行

□ 国家重点实验室 供稿



2016年11月2～5日，2016亚洲光纤通信与光电国际会议（Asia Communications and Photonics Conference,ACP2016）在武汉香格里拉大酒店和光谷希尔顿大酒店同期召开。ACP是亚太地区最大的光通信、光子学、光传感和相关光电技术的会议，也是全球三大光通信会议之一。会议共吸引了来自中国、美国、加拿大、英国、法国、德国、瑞士、瑞典、澳大利亚、新加坡、韩国、日本等20余个国家和地区的一流专家学者、高校院所研究生、工程技术人员、企业研发人员、优秀企业家、投资者以及专业期刊编辑，与会人员超过1000人。

长飞公司 4 篇论文通过同行评审接受，并举办行业唯一国际学术专题研讨会

本届会议由武汉光电国家实验室（筹）承办，长飞公司光纤光缆制备技术国家重点实验室（以下简称“长飞国重”）等协办，华中科技大学副校长、武汉光电国家实验室（筹）常务副主任骆清铭教授等任大会主席，华中科技大学光电信息学院院长张新亮教授和长飞技术总监、国重主任罗杰教授等任大会技术主席；诺贝尔物理学奖得主、美国第十二届能源部部长朱棣文（Steven Chu）教授应邀作主旨发言，长飞公司副总裁张穆应邀代表长飞公司致辞；大会还邀请了OSA主席、美国工程院院士、英国皇家工程院外籍院士Alan E. Willner教授，英国格拉斯哥大学副校长、英国皇家学会院士、爱丁堡皇家学会院士Miles Padgett教授，英国巴斯大学副校长Jonathan Knight教授等世界著名学者。

11月2日，在分会场光谷希尔顿酒店，大会由长飞公司国家重点实验室举办了长飞专题“Applications of New Optical Fibers in Communication and Sensing”的国际学术研讨会。会议邀请了来自中国电信、中国联通、中国信息通信研究院、美国贝尔实验室、韩国、新加坡、香港理工大学和北京邮电大学的8位专家学者作了关于新型及特种光纤在量子通信、长途或短距高速传输系统、空分复用、模分复用和光纤传感等领域的前沿技术研究报告或分析研究报告。ACP2016大会技术主席罗杰教授应邀致开幕辞；大会共同主席、新加坡南洋理工大学Perry Shum教授和长飞国重执行副主任熊良明博士共同主持了学术研讨会。该会议是唯一一场由全球光纤光缆企业在ACP2016大会上组织的Workshop。

在本次ACP大会上，通过评审接收、来自世界光纤光缆前10强企业的论文仅有5篇，其中，长飞公司有4篇论文被接收，含2篇PDP（Post-Deadline Papers）论文，大会PDP论文总共仅11篇。可见长飞公司是当前全球光纤光缆行业技术创新最活跃的企业之一，研究成果领跑全球同行企业。会议论文由美国光学学会(OSA)在线出版，EI收录。

产品展示精彩纷呈

在ACP2016主会场展示大厅，长飞公司携全系列特种光纤，包括熊猫型保偏光纤、掺稀土光纤、传能跳线、弯曲不敏感单模光纤、多芯/少模光纤及耦合器、色散补偿光纤、器件用耦合光纤、耐高温与抗辐射光纤、光子晶体光纤、ETFE松套管光纤、紫外光纤及特种波长光纤、特种管材及耗材等产品精彩亮相。在本次展会上，长飞公司同时展示了最新研发的多芯光纤及多芯光纤通信/传感应用系统，以及光纤

激光器特种光纤产品解决方案。与会嘉宾纷纷来到长飞展台参观和洽谈，对长飞产品兴趣激增，并建立了良好的合作意向。

长飞公司通过光纤光缆制备技术国家重点实验室，已多次成功联合举办ACP这一亚洲乃至全球光纤通信与光电子顶级学术盛会，通过与北京邮电大学、香港理工大学、华中科技大学等国内外著名高校的全面合作实践，加深了彼此的了解与合作，有力推动了技术协同创新。本次全球顶级学术盛会的成功举办，全方位展示了长飞公司的学术活动组织能力和创新实力，大大提高了中国光纤光缆企业在世界光纤通信与光电子领域的学术影响力。

YOFC SKL Gives Assistance in Holding ACP2016 and Becomes a Leader among the Global Peer Enterprises in Research Findings

☐ By the State Key Laboratory

On November 2~5, 2016, the Asia Communications and Photonics Conference (ACP2016) was held in Shangri-la Hotel, Wuhan and Hilton Wuhan Optics Valley. As the largest conference on optical communication, photonics, optical sensing and relevant photoelectric technology in Asia-Pacific Region and one of the world's top three conferences on optical communication, ACP2016 attracted over 1,000 world-class experts, scholars, graduate students from universities and institutions, engineering technicians, R&D personnel of enterprises, excellent entrepreneurs, investors and professional journal editors from over 20 countries and regions, including China, America, Canada, Britain, France, Germany, Switzerland, Sweden, Australia, Singapore, South Korea and Japan.

YOFC Has 4 Papers Peer Reviewed and Accepted, Holds the Only Special International Symposium of the Industry

ACP2016 was undertaken by Wuhan

National Laboratory for Optoelectronics (WNLO) jointly with YOFC State Key Laboratory of Optical Fiber and Cable Manufacture Technology (SKL). Professor Luo Qingming, Vice-President of Huazhong University of Science and Technology and Executive Deputy Director of WNLO acted as Chairman of the Conference. Professor Zhang Xinliang, Dean of School of Optoelectronic Information, Huazhong University of Science and Technology, and Professor Luo Jie, Technical Director of YOFC and Director of YOFC SKL, acted as Technical Chairmen of the Conference. Professor Steven Chu, Winner of the Nobel Prize in Physics and the 12th Minister of the United States Department of Energy, was invited to present a key-note speech. Zhang Mu, Vice-President of YOFC was invited to make a speech on behalf of the Company. Meanwhile, Professor Alan E. Willner, President of OSA, Fellow of the National Academy of Engineering and a Foreign Fellow of the Royal Academy of Engineering (RAE); Professor Miles Padgett, Vice-President of University of Glasgow, Fellow of the Royal Society and Fellow of the Royal Society of Edinburgh; Professor Jonathan Knight, Vice-President of University of Bath, et al. were invited to the Conference.

On November 2, the Applications of New Optical Fibers in Communication and Sensing, an international academic seminar, was held by YOFC SKL in Hilton Wuhan Optics Valley. Eight experts and scholars from China Telecom, China Unicom, China Academy of Information and Communications Technology (CAICT), Bell Laboratory, South Korea, Singapore, the Hong Kong Polytechnic University and Beijing University of Posts and Telecommunications were invited to make a report on the cutting-edge technology research or analysis of new and special optical fiber in the fields of quantum communication, long-distance or short-distance high-speed transmission system, space division multiplex (SDM), mode division multiplex and optical fiber sensing. Professor Luo Jie was invited to deliver an opening speech. Professor Perry Shum from Nanyang Technological University, Co-Chairman of the Conference, and Dr. Xiong Liangming, Executive Deputy Director of YOFC SKL, were invited to preside over the Seminar. It was the only Workshop organized by optical fiber and cable enterprises around the world during ACP2016.

At ACP2016, among the 5 papers received from the world's top 10 optical fiber and cable enterprises, 4 were submitted by YOFC, including 2 post-deadline papers. There were altogether 11 PDPs accepted at ACP2016. It thus could be seen that YOFC is now one of the most active enterprises in technical innovation within the global optical fiber and cable industry, becoming a leader among the global peer enterprises in terms of research findings. These papers will be published online by OSA and included in EI.

Brilliant Product Display

In the exhibition hall, a full range of special optical fiber, including the panda polarization-maintaining optical fiber, rare earth doped fiber, energy-transferring jumper, BI-SMF, multi-core/few-mode optical fiber, coupler, DCF, coupling fiber for devices, high-temperature resistant optical fiber, radiation-resistant optical fiber, photonic crystal fiber, ETFE loose-tube fiber, UV optical fiber, special wavelength optical fiber, special tubular products and consumables, were exhibited by YOFC. Meanwhile, YOFC presented their new multi-core optical fiber, multi-core optical fiber communication/sensing application system as well as fiber laser and special optical product solutions. The participants were so interested in YOFC's products and established good cooperation intention.

YOFC SKL has successfully given assistance in holding ACP, a top-level academic event on optical fiber communication and photoelectron in Asia and even across the world, for many times. The comprehensive cooperation with Beijing University of Posts and Telecommunications, Hong Kong Polytechnic University, Huazhong University of Science and Technology, etc. has deepened the mutual understanding and further cooperation and effectively promoted the collaborative innovation. This successful global academic event comprehensively shows YOFC's organizing ability in academic activities and innovation strength, greatly increasing the academic inßuence of the optical Þber and cable enterprises from China in the global optical fiber communication and photoelectron field.

长飞公司承担的国家科技部“863计划”重大专项课题顺利通过技术验收

□ 国家重点实验室 供稿

2016年10月19日，国家科技部高技术研究发展中心组织专家对长飞公司承担的国家高技术研究发展计划（以下简称“863计划”）重大专项课题“先进光纤传感器系统研制及应用”进行了现场技术验收。专家组认为该课题突破了大电流、位置（包括导航、姿态和大型复杂机械装备运行状态）、应力、温度等多物理量测量用的基础器件和多项系统关键技术，并形成了产业化能力，研发出系列光纤传感器件与系统，实现了预期目标，一致同意通过验收。

该课题于2012年2月正式立项，牵头单位是长飞公司，参与单位包括华南理工大学、武汉理工大学、武汉长盈通光电技术有限公司、中国科学院上海光学精密机械研究所、武汉理工光科股份有限公司等，项目负责人是长飞公司国家重点实验室执行副主任熊良明博士。与传统传感器相比，光纤传感器具有更安全、可靠、准确、测量范围宽、节能和低碳环保等特点，可广泛应用于国防、航空航天、智能电网、土木工程、环境监测、物联网等多领域，对于我国工业、国防及其它众多高技术领域的发展具有十分重要的战略意义。在国家863计划的支持下，长飞公司牵头携手参与单位，开展了先进光纤传感器系统研制及应用的相关工作。

经过4年攻关，课题组攻克了特种光纤、宽谱光源、单频光纤激光器、光纤陀螺环、高速高精度解调仪等基础器件和关键技术，突破了光纤传感系统工程化产业化技术瓶颈，实现了

保偏-光子晶体-掺稀土光纤等特种光纤技术集成；光源谱宽介于400～2400nm可调且输出功率达到7W以上；单频光纤激光器3dB线宽小于1.1kHz；光纤陀螺环品种国内最齐全，且最高精度达0.3‰；核心部件全部自主开发的解调仪实现了单通道及多通道同时运行时，达到4000Hz的高速高精度解调。基于上述基础器件和关键技术的突破，课题组研制了温度稳定性显著提高、测量精度达到0.2/5P级、电流测量范围达到36000安培（电网一般为1200安培）的全光纤电流互感器系统，并为国家电网研究单位输出了成果应用。在国内，课题组率先开发了BOTRD光纤传感系统，并在电力电缆和铁路线上实现工程应用示范；率先实现了光纤光栅传感系统在大型复杂机械装备上的工程应用。课题组已掌握了多项光纤传感系统用的基础器件和产业化关键技术，填补了我国相关领域核心部件或关键光纤传感器件的空白。课题执行期间，课题组共发表了41篇论文（含SCI/EI论文25篇），制修订了1项国际标准，申请了22项发明专利、10项计算机软件著作权；部分研究成果已完成了转化，形成了产业化能力，累计完成8800多万元的销售收入。

通过本课题的实施，长飞公司实现了保偏光纤、光子晶体光纤和掺稀土光纤的产品化和特种光纤集成技术，研制了分布式光纤温度应变传感系统样机、系列新型光纤传感器件，开发了高速高精度解调仪和状态智能分析系统、机械装备运行状态智能感

知云服务平台原型系统，实现了对大型复杂机械装备运行状态的温度、压力、应力应变、加速度、位移等多参数分布式在线监测。同时，该课题的验收表明我国已经掌握了光纤传感器件关键技术，形成了特种光纤和光纤陀螺环的产业化能力和光纤传感系统的工程应用能力，提升了我国自主研制光纤传感器的系统化技术水平，推进了传统行业转型升级，加快了我国制造业不断向智能监测和智能制造迈进的步伐。

该“863计划”课题的研究内容广、参加单位与研究团队多、组织实施工作复杂，课题的顺利验收充分展现了长飞公司承担国家重大科研项目的科研实力与组织能力。

The Key Special Research Project under “863 Program” of the Ministry of Science and Technology of the PRC Undertaken by YOFC Successfully Passes the Technical Acceptance

☐ By the State Key Laboratory

On October 19, 2016, the High Technology Research and Development Center of the Ministry of Science and Technology of the PRC invited experts to make field technical acceptance of the key special research project under the national high technology research and development program (hereinafter referred to as the “863 Program”) undertaken by YOFC - the Research, Development and Application of Advanced Optical Fiber Sensor System. The panel unanimously agreed on the acceptance of the project because the expected goals were achieved. For example, breakthroughs were made in basic devices for multi-parameter measurement, such as the large current, location (including the navigation, attitude and operating state of large complicated mechanical equipment), stress and temperature, as well as key system technologies; the capability of industrialization was established; and a series of optical Þber sensing devices and systems were successfully developed.

This research project was officially approved in February 2012. Led by YOFC, the South China University of Technology, Wuhan University of Technology, Yangtze Optical Electronic Co., Ltd. (YOEC), Shanghai Institute of Optics and Fine Mechanics, the Chinese Academy of Sciences, Wuhan Ligong Guangke Co., Ltd., etc. took part in this project, with Dr. Xiong Liangming, Executive Deputy Director of YOFC State Key Laboratory, being the Project Leader. Compared with traditional sensor, the optical fiber sensor is characterized by a higher level of safety, reliability and accuracy, a wider range of measurement, energy conservation, low carbon and environmental protection. It could be widely applied to the national defense, aerospace, smart power grid, civil engineering, environment monitoring, Internet of Things, etc., being of great strategic significance to the national industrial development, national defense and other high-technology fields. Supported by the 863 Program, YOFC, jointly with other enterprises concerned, put great efforts in the research, development and application of advanced optical fiber sensor system.

After 4 years of efforts, the research group made great achievements in basic devices and key technologies, such as the special optical fiber, broadband optical source, single-frequency Þber laser, optical Þber gyro ring and high-speed & high-precision demodulator; made breakthroughs in the engineering industrialization technology for optical fiber sensor system; and realized the polarization-maintaining - photonic crystal - rare earth doped fiber technology integration. The spectrum width of optical source ranges from 400nm to 2,400nm, adjustable. The output power is greater than 7W. The single-frequency Þber laser of 3dB has a line width less than 1.1kHz. There is a complete range of optical Þber gyro rings in China, with the precision up to 0.3‰ . The demodulator, of which all core components are developed independently, realizes the simultaneous operation of single channel and multiple channels, with the high-speed & high-precision demodulation up to 4,000Hz. Based on the above breakthroughs in the basic devices and key technologies, the research group developed the all-fiber optical current transformer system, with temperature stability considerably improved, measurement accuracy up to 0.2/5P and electric current measurement range to 36,000 A (generally 1,200 A for the power grid), and ensured application of results to the state grid research units. In China, the research group was the first to develop the BOTRD optical fiber sensor system and set an example in the application to the power cable and railway line. Meanwhile, it was the first to apply the optical Þber grating sensor system to large complicated mechanical equipment. The research group has mastered the basic devices and key industrialization technologies for multiple optical fiber sensor systems, filing in gaps in core components or key optical fiber sensor devices in relevant fields in China. During the research, the research group published altogether 41 papers, including 25 SCI/EI papers; revised 1 international standard; and applied for 22 patents for invention and 10 copyrights of computer software. Some research findings had been translated into practice, establishing the capability of industrialization. The sales revenue totaled to over CNY 88 million.

Based on the research, YOFC realized the productization of polarization-maintaining optical fiber, photonic crystal fiber and rare earth doped fiber as well as the special optical fiber integration technology; made

research on and developed the distributed optical fiber (temperature and strain) sensor system prototype and new optical fiber sensor devices; developed the high-speed & high-precision demodulator, intelligent state analysis system and prototype system of intellisense cloud service platform for mechanical equipment operating state; and realized the multi-parameter distributed online monitoring of the temperature, pressure, stress-strain and displacement of large complicated mechanical equipment in operation. Meanwhile, the acceptance of this research indicates that China has mastered the key technologies for the optical fiber sensor devices, established the capability of industrialization of special optical fiber and optical fiber gyro ring as well as the engineering application ability of optical fiber sensor system, improved our systematic technology for the independent development and production of optical fiber sensors, promoted the transformation and upgrading of traditional industries, and accelerated the domestic manufacturing industry towards the intelligent monitoring and intelligent manufacturing.

The "863 Program" involves a variety of research projects, a large number of participants and research groups, and complicated organization and implementation tasks. Therefore, the successful acceptance of this research fully indicates YOFC's scientific research strength and organizing ability when undertaking the national key scientific projects.

长飞公司应邀出席
第三届世界互联网大会中非互联网合作论坛

□ 战略中心　周钦敏

2016年11月16日，第三届世界互联网大会在浙江乌镇隆重开幕，长飞公司受邀出席此次会议。

在本届大会的分论坛——中非互联网合作论坛上，长飞公司副总裁闫长鹃发表了《长飞公司助力非洲互联网基础建设》主题报告，向与会嘉宾介绍了长飞公司助力非洲互联网基础设施建设和长飞非洲公司的相关情况。2016年5月，长飞非洲公司在南非德班隆重奠基，公司总部位于南非约翰内斯堡。长飞非洲公司将立足南非，辐射整个非洲，成为南非乃至非洲地区最具影响力的光纤光缆供应商。作为全球领先的光纤光缆企业，长飞公司生产的光缆已被埃及、肯尼亚、南非、尼日利亚、苏丹等非洲国家采用敷设，长飞公司也已完成尼日利亚全国网、利比亚国家网、埃及电信骨干网等多个非洲重点项目。

论坛结束后，闫总还接受了湖北电视台的专访。他表示，中国与非洲虽相隔万里，但中非合作历史渊源，长飞愿用光纤作为桥梁，积极参加中非互联网合作发展，为非洲互联网建设做出贡献。

YOFC Presented at Sino-Africa Internet Cooperation Forum of the 3rd World Internet Conference upon Invitation

□ Zhou Qinmin from Strategic Center

On November 16, 2016, the 3rd World Internet Conference was grandly held in Wuzhen, Zhejiang. Upon invitation, YOFC presented at the Conference.

In the branch forum of the Conference, i.e. Sino-Africa Internet Cooperation Forum, Yan Changkun, Vice President of YOFC, made a thematic report titled the YOFC Facilitates Internet Infrastructure Construction in Africa, to introduce to all guests related situations concerning YOFC's facilitating Internet infrastructure construction in Africa, as well as YOA. May 2016, foundation stone of YOA was grandly laid in Durban, South Africa. The Company is headquartered in Johannesburg, South Africa. YOA is established in South Africa to serve the entire Africa, becoming the most influential optical fiber and cable supplier in South Africa and African regions. As a world leading optical fiber and optical cable enterprise, optical cables manufactured by YOFC have been widely applied in Egypt, Kenya, South Africa, Nigeria, Sudan, etc. YOFC has completed several key projects in Africa, such as nationwide network of Nigeria, national network of Liberia, backbone network of Egypt, etc.

After the forum, General Manager Yan accepted the special interview by Hubei TV Station. He expressed that, although China was far away from Africa, Sino-African cooperation had a long history. YOFC was willing to take optical Þbers as the bridge, actively taking part in the cooperation and development of Sino-African Internet and contributing to the construction of the Internet in Africa.

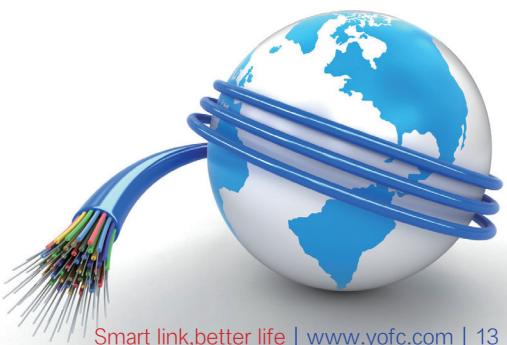
长飞国家重点实验室成立第二届学术委员会并召开第一次会议

□ 国家重点实验室 供稿

2016年11月3日，长飞公司聘请成立了光纤光缆制备技术国家重点实验室第二届学术委员会，并隆重召开了第二届学术委员会第一次会议。公司总裁庄丹博士代表建设依托单位，对出席会议的国家科技部、湖北省科技厅的领导和专家委员表示热烈欢迎，为第二届学术委员会主任、副主任、委员以及管理团队颁发了聘书。

本届学术委员会主任为国家信息化专家咨询委员会副主任、中国互联网协会理事长邬贺铨院士，副主任有国家信息化专家咨询委员会委员刘韵洁院士，北京邮电大学副校长任晓敏教授和长飞光纤首席科学家R.Matai先生。学术委员有新加坡南洋理工大学Perry Shum教授、中国电信张成良副院长、华中科大刘德明教授、武汉理工大赵修建教授、电子科大饶云江教授、上海通信学会杜柏林教授、长芯盛公司总经理张树强和长飞研发中心总经理王瑞春、副总经理兼光缆技术总监熊壮。会上还成立了以长飞技术总监罗杰教授为主任、熊良明博士为常务副主任、唐常伟高工为副主任的实验室新一届管理团队。

随后，学术委员会主任邬贺铨院士主持召开了第二届学术委员会第一次会议。实验室主任罗杰作了实验室年度工作报告，学术委员就光纤光缆技术未来如何发展、光纤应用方向、如何进一步提升实验室建设发展水平等进行了广泛而深入研讨。科技部、省科技厅的领导对实验室建设发展中所取得的成绩给予了充分肯定；友好实验室——上海交大区域光纤通信网与新型光通信系统国重主任何祖源教授应邀出席了会议；公司部分学术带头人列席了会议。



YOFC State Key Laboratory Set Up the Second Academic Committee and Held its First Meeting

☐ By The State Key Laboratory

On November 3 2016, YOFC appointed and set up the second academic committee of the State Key Laboratory of Optical Fiber and Cable Manufacture Technology (SKLOFCMT) and grandly held its first meeting. On behalf of the construction supporting units, YOFC CEO Dr. Zhuang Dan expressed his warm welcome to the leaders and experts from the Ministry of Science and Technology of the P.R.C. and the Science and Technology Department of Hubei Province, and issued the letters of appointment to the director, vice directors and management team of the second academic committee.

Academician Wu Hequan, deputy director of the Advisory Committee for State Information (ACSI) and president of the Internet Society of China, serves as the director of this academic committee. Liu Yunjie, ACSI member and academician, Ren Xiaomin, vice president and professor of Beijing University of Posts and Telecommunications (BUPT), and Mr. R. Matai, chief scientist of YOFC, serve as the deputy directors. The academic members consist of Perry Shum, professor of Nanyang Technological University (NTU), Singapore, Zhang Chengliang, vice president of China Telecom, Liu Deming, professor of HUST, Zhao Xiujian, professor of WUT, Rao Yunjiang, professor of UESTC, Du Bolin, professor of SHSIC, Zhang Shuqiang, general manager of Everpro, Wang Ruichun, general manager of the R&D Center of YOFC, and Xiong Zhuang, deputy general manager and currently chief optical cable technical ofÞcer. A new management team of the Laboratory is also set up, with Luo Jie, chief technical ofÞcer and professor of YOFC being the director, Dr. Xiong Liangming being as the executive vice director, and senior engineer Tang Changwei being the vice director.

Later, academician Wu Hequan, director of the academic committee, chaired the first meeting of the 2nd academic committee. Luo Jie, director of the Laboratory, made the annual work report of the Laboratory. The academic members extensively and deeply discussed how to develop the optical Þber and cable technologies in the future, use optical fibers, and to further improve the construction & development of the Laboratory, etc. The leaders from the Ministry of Science and Technology of the P.R.C. and the Science and Technology Department of Hubei Province fully appreciated the achievements of the Laboratory in the construction and development. He Zuyuan, professor and director of a sister laboratory –State Key Laboratory of Advanced Optical Communication Systems and Networks of Shanghai Jiao Tong University, was invited to attend the meeting. Some academic leaders of YOFC also attended the meeting.

长飞公司应邀参加
2016 年香港铁路有限公司工程臻善圈周年发布大会

☐ 制造中心 张安林

2016年11月25～30日，香港铁路有限公司工程臻善圈周年发布大会在香港理工大学蒋震剧院隆重举行。长飞公司作为受邀的武汉市企业代表参加了此次交流活动，长飞公司制造中心光纤部北极星QC小组展示了课题成果——《减少光纤划伤报废量》，并与各参会QC小组进行了全面而深入的交流。

在交流现场，长飞公司QC小组代表逻辑清晰地介绍了如何查找关键原因和改善过程，生动精彩地展示了小组成员如何运用集体智慧和QC活动程序解决问题，全面阐述了如何运用创新测试工具和自动控制设计方法，获得了与会代表们的一致好评。

长期以来，长飞公司非常重视质量管理，自2012年起便连续开展了“长飞质量年”、“质量知识竞赛”等一系列活动，并以此作为提高产品质量、降低生产成本、提升员工创新能力和业务水平的有效途径。运用质量管理的理论和方法全面而深入地开展活动，使长飞公司改善了现场问题、提高了经济效益并取得了卓越成效。

YOFC Attended 2016 Engineering Quality Circle Anniversary Press Conference of MTR Corporation upon Invitation

☐ Zhang Anlin from Manufacturing Center

On November 25-30, 2016, the Engineering Quality Circle Anniversary Press Conference of MTR Corporation was grandly opened in Jiang Zhen Theater of Hong Kong Polytechnic University.YOFC was invited to participate in the exchange activity as a representative of enterprises in Wuhan. In the conference, Polaris QC Group of Fiber Production Department of YOFC Manufacturing Center showed their research achievement – the Reduction of Optical Fiber Scratch Scrappage, and carried out profound and all-around exchange with other QC groups at the conference.

At the site, QC Group of YOFC logically and clearly introduced how to Þnd key reasons and improvement process, which vividly demonstrated how the group members utilized collective wisdom and QC activity procedure to solve problems. They also fully stated how to take advantage of innovative test tools and automatic control methods, which were highly praised by representatives at the conference.

For a long time, YOFC has attached great importance to quality management. Since the year of 2012, YOFC successively launched a series of activities, such as “YOFC Quality Year” and “Quality Knowledge Contest”. These activities were effective to improve the product quality, reduce production cost, and improve employees’ innovation ability and business level. Quality management theories and methods were fully utilized in the activities, which solved site issues of YOFC and improved economic beneÞts, with good effect achieved.

长飞公司董事会一行视察长飞潜江公司及科技园

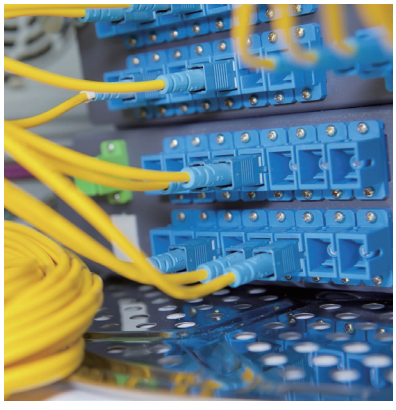
□ 长飞潜江公司 唐琦

2016年11月18日，长飞公司董事会董事长文会国、董事马杰、姚井明、杨国琦、熊向峰、郑慧丽、李平、李卓，董事监事刘德明、李长爱，长飞公司总裁庄丹，潜江市委书记胡功民、市长黄剑雄来到长飞潜江科技园，视察了建设中的长飞潜江公司。

长飞潜江公司总经理罗杰向公司董事会、总裁庄丹、潜江市领导详细介绍了长飞潜江公司的基本情况和建设进展，长飞公司工程项目管理部经理刘爱斌介绍了长飞科技园的厂区布置、现阶段建设及远期规划。随后，在公司总裁庄丹和罗杰总经理的陪

同下，董事会文董事长、各位董事和潜江市领导一行进入预制棒车间和光纤车间参观了设备安装调试现场，全面视察了自主预制棒项目和光纤项目的实施情况，对项目建设达到计划预期给予了充分肯定，同时希望长飞潜江公司尽快投产并不断发展壮大。

作为长飞公司未来单模光纤和预制棒的骨干生产基地，长飞潜江公司将继续同心协力继续拼搏，以确保建设按质按期完成、生产的规范高效运营，为支撑和推动长飞集团进一步发展而奉献力量。



YOFC Board of Directors Visited YOFC (Qianjiang) and Technology Park

☐ Tang Qi from YOFC (Qianjiang)

On November 18, 2016, YOFC Board of Directors, including Chairman Wen Huiguo, Directors of Ma Jie, Yao Jingming, Yang Guoqi, Xiong Xiangfeng, Zheng Huili, Li Ping, Li Zhuo, Supervisors of Liu Deming, and Li Changai, as well as Qianjiang Municipal Party Secretary Hu Gongmin, and Mayor Huang Jianxiong arrived at YOFC (Qianjiang) Technology Park to survey YOFC (Qianjiang) under construction.

Luo Jie, General Manager of YOFC (Qianjiang) introduced to the Board of Directors of the Company, President Zhuang Dan, and leaders of

Qianjiang City in detail the basic situation and construction progress of YOFC (Qianjiang) . Liu Aibin, Manager of YOFC (Qianjiang) Project Management Department, introduced the plant layout, current construction, and long-term plan of YOFC Technology Park. After that, accompanied by President Zhuang and General Manager Luo Jie of the Company, Chairman Wen of Board of Directors, directors of the Company, and leaders of Qianjiang City entered the preform workshop and optical Þber workshop, and visited the equipment installation and commissioning site. They fully inspected the implementation progress of independent preform project and optical fiber project, highly commented the construction achievements of the project, and expressed the wish that YOFC (Qianjiang) would be soon put into production for further development.

As a backbone production base of YOFC for single-mode fiber and preform in future, YOFC (Qianjiang) will continue uniting concerted efforts and striving, so as to assure on-time and high-quality competition of the construction, as well as standard and efficient operation of production, contributing to the further development of YOFC Group.

长飞印尼公司完成首批光纤供货

□ 长飞印尼公司 Vivi

长飞印尼公司是由长飞公司和印尼PT MONAS公司合资成立的东南亚第一家光纤制造企业。长飞印尼公司在2016年8月17日印尼独立纪念日当天，制造出印尼乃至东南亚第一根光纤，并于9月8日举行了隆重的开业典礼。

近日，长飞印尼公司迎来重大进展，其生产的光纤经过了长飞集团严格的光纤质量认证流程后，于2016年10月3日首次向印尼光缆企业PT JEMBO实现光纤供货，这标志着长飞印尼公司的经营迈上正轨。截至发稿，长飞印尼公司已经向本地光缆企业完成光纤供货超过40万芯公里。据悉，长飞印尼公司还与当地主要的光缆制造企业客户签署了2017年供货协议，将向这些企业交付超过300万芯公里的光纤。

长飞印尼公司作为东南亚第一家也是唯一的光纤制造企业，必将为该地区的通信事业和经济发展做出重要贡献，让该地区的人民真正享受到光纤通信带来的便捷和快乐！

2016 年 10 月 3 日，长飞印尼公司第一批光纤发货现场

YOFI Completed Delivery of the First Batch Optical Fibers

□ Vivi from YOFI

YOFI is the first optical fiber manufacturing enterprise jointly established by YOFI and Indonesian PT MONAS. YOFI manufactured the first optical fiber in Indonesia and Southeast Asia on August 17, 2016, Indonesia's Independence Day, and held a grand opening ceremony on September 8.

October 3, 2016, Delivery of the First Batch Optical Fibers by YOFI

Recently, YOFI ushered in a great progress. Its optical fiber product passed the strict quality certification process of YOFC Group, and was supplied to the Indonesian optical Þber enterprise of PT JEMBO for the Þrst time on October 3, 2016, which signiÞed that, operation of YOFI was formally on track. So far, YOFI has supplied over 400,000 core kilometers of optical fibers to local optical fiber enterprises. It was learned that, YOFI also signed the 2017 Supply Agreement with main local optical fiber manufacturing enterprises to supply more than 3 million core kilometers of optical Þbers to these enterprises.

As the first and the only optical fiber manufacturing enterprise in Southeast Asia, YOFI will surely make great contributions to communication and economic development of the region, enabling people of the region to truly enjoy the convenience and happiness of optical fiber communication.

光缆市场高速发展，培训员工保障产品质量

☐ 长飞中利公司 黄勤

近年来光纤光缆行业得到了迅猛发展，与此同时，各大运营商对产品质量的要求也越来越高。近日，长飞中利公司在全体产线员工中开展了“明确岗位责任、提高产品质量”的岗位培训考核活动。公司工艺技术组把光缆生产每道工序关键参数、员工必备的自检项、常见的次品现象如何预防纠正等做成书面教材，组织员工学习领会。

“产品的质量是生产出来的，不是检验出来的！”美国质量管理大师戴明(EdmersDeming)曾经这样说过。工厂中最重要的人是那些默默在具体工作中进行操作的普通员工,正是这些普通的员工支撑起宏伟的工厂，他们的每一个操作步骤都直接关系到产品的质量。长飞中利这次培训就是让新老员工懂得如何做出合格的光缆产品，逐步地一次性把自己的工作做好，为公司的效益提升而努力。

由于轮班原因，培训考核在下夜班后进行，员工们克服夜班后的困乏，积极听讲答题，整个培训工作圆满完成。员工们积极与技术人员探讨工艺技术难题，普遍反映通过此次活动，以前对本岗位必备光缆知识点模糊的地方有了明确的答案，同时对如何预防、杜绝生产中常见的次品现象具备一定的认知能力，为保质保量完成生产任务打下了坚实的基础。可见为期半个月的学习培训取得了应有的效果。

Training Employees to Assure Product Quality in Fast Developing Optical Cable Market

☐ Huang Qin from YOFC (Jiangsu)

In recent years, the optical fiber and optical cable industry has been developing fast. Meanwhile, major operators' requirements on product quality become increasingly higher than before. Recently, YOFC (Jiangsu) launched post training and examination activities in all employees, with the aim "to specify post duties and to improve product quality". Process and Technical Group of the Company turns key parameters of every process in optical cable production, necessary self-inspection items for employees, common defect phenomena, prevention, and rectiÞcation method into text books for employees to study and comprehend.

"Product quality lies in production rather than inspection!" said by Edmers Deming, an US Quality Management Master. The most important persons in a factory are ordinary employees engaged in concrete works and operations. It is these ordinary employees who prop up a great factory. Their every operating step is directly related to the quality of products. This training in YOFC (Jiangsu) is just designed to help new and old employees understand how to make qualified optical cables, so as to do their work well one off, and to make efforts for improvement of the Company's beneÞts.

Due to the shift change, the training and examination

was carried out after night shift. However, employees of YOFC (Jiangsu) overcame the fatigue after night shift, carefully listening to the lecture, and successfully completed the training. Employees actively discussed process and technology issues with technicians. They all responded that, uncertain optical cable knowledge necessary in their posts was speciÞed through the activity. Meanwhile, they acquired certain methods to prevent and eliminate common defective products in production, which laid a solid foundation to fulfill the production tasks in both quality and quantity. It can be seen that, the half-month learning and training has made the expected achievements.

长飞公司生产第二支部
积极开展“支部主题党日”活动

☐ 运营管理中心 韩璐

2016年11月8日，在公司党委的统筹安排下，生产第二支部开展了十一月份“支部主题党日”活动。本次活动的主要内容包括组织党员对照“四讲四有”合格党员标准，开展了“对照职能职责，看作用发挥好不好”的专题讨论，认真传达学习了党的十八届六中全会精神和习总书记在纪念长征胜利80周年大会上的重要讲话，并学习了党费收缴、总结前期“百日抄写党章”活动成果、深化党员信仰等。

会上，支部书记熊壮同志邀请支部宣传委员韩庆荣同志对全体党员讲授了专题党课。韩庆荣同志结合当前公司组织的CRU会议的最新成果，生动详实地阐述了作为一名长飞人、一名中国共产党员，应如何在新时期新形势下履职尽责，发挥出自身的先锋模范带头作用。党员代表靳绍君、焦卫、赵万庆3位同志对照本次支部党日的主题进行了思想汇报，他们分别从自身岗位特点出发，从销售服务意识、生产精益管理、技术水平提升等几个方面阐述了自己立足本职岗位，发挥自身价值的心路历程。

The 2nd Production Party Branch of YOFC Actively Took Party in “Thematic Party Day” Activity

☐ Han Lu from Operation Mangement Center

On November 8, 2016, under the coordinated arrangement of Party Committee of the Company, the 2nd Production Party Branch organized “Thematic Party Day” Activity of November. The activity was mainly designed to organize party members to take part in the thematic discussion of “checking whether due duties were fulfilled according to regulations concerning responsibilities and duties” in accordance with standards for qualified party members, i.e. “four stresses and four emphases”. In the activity, party members carefully studied the spirit of the Sixth Plenary Session of the 18th CPC Central Committee, the important speech by General Secretary Xi in the Convention to Commemorate the 80th Anniversary of the Victory of the Long March, as well as collection of party membership dues, summary of achievements in “Transcription of Party Constitution” activity, and deepening of party member belief.

In the activity, Xiong Zhuang, Secretary of the Party Branch invited Han Qingrong, Commissary in Charge of Publicity, to give a special party lecture to all party members. Integrating with latest achievements of CRU meeting previously organized by the Company, Comrade Han Qingrong vividly presented howemployees of YOFC should fulfill their duties as party membersunder the new circumstances, so as to bring to play their modeling and leading role. Party member representatives, Jin Shaojun, Jiao Wei, and Zhao Wanqing separately make ideological report according to the theme of the activity. Starting from their own job characteristics, they shared with all party members their experience of bringing to play their own values at their respective post, in aspect of sales service awareness, production lean management, technical level improvement, etc.

长飞公司获《彭博商业周刊/中文版》“年度上市企业2016”、“最具投资价值奖”两项殊荣

☐ 战略中心 柳青

近日，由《彭博商业周刊/中文版》主办的“年度上市企业2016”庆典在香港金钟港丽酒店隆重举行，长飞公司应邀参加本次活动，并获“年度上市企业2016”、“最具投资价值奖”两项殊荣，长飞公司副总裁张穆出席庆典并代表公司领奖。

《彭博商业周刊/中文版》是香港地区最具影响力的财经杂志，首度举办“年度上市企业2016”活动，旨在帮助投资者发掘高质素的上市企业，加深公众对杰出上市企业的认识，并为上市公司建立一个互相交流、共同成长的平台。所有出席此次活动的上市企业均通过财经界名人及专家组成的专业评审团严格评选，在各个业务范畴表现突出。包括长飞公司、新世界发展有限公司、腾讯控股有限公司在内的17家企业荣获“年度上市企业2016”；长飞公司（“最具投资价值奖”）、中国海外发展有限公司（“最佳领导能力奖”）等5家企业分别荣获表现类奖项。

YOFC: Bloomberg Businessweek/China “Listed Company in 2016” and “Most Valuable Company in Investing”

☐ Liu Qing from Strategic Center

Recently, Bloomberg Businessweek/China “Listed Company in 2016” ceremony has been held ceremoniously in Conrad Hong Kong and YOFC was invited. The company became “Listed company in 2016” and “Most valuable company in investing”. Zhang Mu, vice president of YOFC attended the ceremony and received the award on behalf of the company.

Bloomberg Businessweek/China is the most influential business magazine in HK. The “Listed company in 2016” event for the Þrst time aims to help the investors to Þnd out those high-quality listed companies, deepen the awareness of outstanding listed company and provide listed companies with a platform for mutual communication and common development. All the listed companies present are selected strictly by the judging panel made of Þnancial celebrities and experts. Besides, the companies have great achievement in the industry. 17 enterprises including YOFC, New World

Development Company Limited and Tencent Holdings Co., Ltd. became “Listed companies in 2016”. 5 companies including YOFC (Most valuable company in investing) and China Overseas Land & Investment Ltd. (best leadership award) were awarded in performance.

“十连冠”
长飞公司喜获 ODC'2016 多项大奖

□ 战略中心 张方海

11月16日，2016（第十届）中国光通信发展与竞争力论坛暨2016全球|中国光通信最具竞争力企业10强评选活动颁奖典礼（ODC'2016）在北京京仪大酒店隆重举行。

长飞囊括多项大奖

长飞公司一举囊括多项极具含金量的大奖，且连续十年持续荣获“中国光纤光缆最具竞争力企业10强”(第一名)、“全球光纤光缆最具竞争力企业10强”（第二名）、“中国光通信市场最具品牌竞争力企业10强”（第五名）。同时，长飞公司还获得了“2016中国光通信最具‘工匠精神’企业大奖”。长飞公司副总裁张穆出席论坛并代表公司领奖。

长飞公司在我国光纤光缆行业深耕多年，是最早获得市场认可的国产光纤品牌。此次评选充分说明了业界对长飞公司在光纤光缆行业主导地位的高度认可。未来，在“致力于棒纤缆的智能制造和光纤技术的广泛应用，成为信息传输与智能连接领域的领导者和行业最具价值的公司”的愿景下，长飞公司将继续本着“客户至上、质量先行、以人为本、创新发展”的经营理念，精耕细作，实现“全球第一、行业领袖”的战略目标。

结合 73 项要素指标进行评选

ODC论坛自2006年起，迄今已成功举办了10届。十年间，ODC论坛与中国光通信行业共同成长，密切跟踪光通信行业快速多变的发展趋势，深入探讨我国光通信产业发展的成就和创新格局，充分把握中国光通信技术应用的趋势和发展机遇，在我国光通信事业的发展上发挥着举足轻重的作用。

2016年全球|中国光通信最具竞争力企业10强评选活动由网络电信信息研究院（NTI）、中国通信学会光通信委员会、亚太光通信委员会共同参与，评选小组由国内通信领域和经济学、管理学、统计学等领域的权威专家组成。各项大奖根据参评企业的生产规模、市场表现、产品性能、售后服务、增长速度和企业管理及文化等方面共73项要素指标进行评选，对参选企业的竞争力进行了客观、系统的分析，为光通信行业竞争力分析提供了参考依据。

2016 年全球 | 中国光通信最具竞争力企业 10 强各领域榜单

《2016年全球光纤光缆最具竞争力企业10强》：康宁、长飞、亨通光电、普睿司曼、古河电工、烽火通信、富通、住友电工、中天、藤仓；

《2016年中国光纤光缆最具竞争力企业10强》：长飞、亨通光电、烽火通信、富通、中天、通鼎、特发信息、永鼎、通光、普天法尔胜；

《2016年中国光通信市场最具品牌竞争力企业10强》：华为、烽火科技、诺基亚和上海贝尔、中兴、长飞、帝斯曼、康宁、古河电工、菲尼萨、Microsemi（原PMC-Sierra）。

"10 consecutive times YOFC winning the awards of ODC in 2016

☐ Zhang Fanghai from Strategic Center

On November 16, 2016 (10th) China Optical Communications Development and Competitiveness Forum and the Awarding Ceremony of "the Top 10 Competitiveness Enterprises of 2016 in the Optical Communications Field of Global & China Market" (ODC 2016) was held ceremoniously in Beijing Jing Yi Hotel.

YOFC winning many awards

YOFC won many valuable awards. And it becomes one of the "10 most competitive enterprises in China's optical Þber and cable industry (the Þrst one)", one of the "10 most competitive enterprises in world's optical fiber and cable industry (the second one)" and one of the "10 most competitive brand in China's optical communications market (the fifth one)" for ten consecutive years. Meanwhile, YOFC won the award of "enterprise with most craftsmanship in China's optical communications" in 2016. Zhang Mu, vice president of YOFC attended the forum and received the awards on behalf of the company.

Working in China's optical fiber and cable industry for many years, YOFC is the earliest optical Þber brand with market approval. This forum shows clearly that the industry speaks highly of the dominating role of YOFC in optical fiber and cable industry. In the future, with the aspiration of "the intelligent making of rod Þber and cable and wide application of optical fiber technology to become the leader and the most valuable company in communications and intelligent connecting", YOFC will continue to adhere to the operation value of "customer foremost, quality based, people oriented and innovation supreme" and realize the strategic goal of "top 1 in the world and the industry".

The selection based on 73 indexes

Since 2006, ODC Forum has been held successfully for 10 times. In the 10 years, ODC Forum develops with China's optical communications, keeps an eye on the changeable trend in the industry, discusses deeply the achievement and innovation in China's optical communications, seizes the application and opportunities of optical communication technology and plays an important role in the industry.

The selection of "the Top 10 Competitiveness Enterprises of 2016 in the Optical Communications Field of Global & China Market" is made by NTI, Optical Committee of China Institute of Communications and Asia-Pacific Optical Communications Committee. The judging panel consists of authoritative experts in the field of communications, economics, management and statistics. 73 indexes including scale, market performance, product function, after-sale service, increasing rate, enterprise management and corporate culture are taken into account. Objective and systematic analysis is made on the competitiveness of participating enterprises, providing data for the competitiveness analysis in optical communications.

The different lists of "the Top 10 Competitiveness Enterprises of 2016 in the Optical Communications Field of Global & China Market"

10 most competitive enterprises in world's optical fiber and cable industry: Corning, YOFC, HTGD, Prysmian, Furukawa Electric, FiberHome, Futong, SUMITOMO ELECTRIC, Zhongtian, Fujikura.

10 most competitive enterprises in China's optical fiber and cable industry: YOFC, HTGD, FiberHome, Futong, Zhongtian, Tongding, SDGI, Etern, TG, Potevio-Fasten.

10 most competitive brand in China's optical communications market: Huawei, FiberHome, Nokia and Alcatel Lucent, ZTE, YOFC, DSM, Corning, Furukawa Electric, Finisar, Microsemi (PMC-Sierra formerly).

长飞公司荣获华为“最佳合作伙伴”

□ 销售中心 叶文静

2016年11月15日，华为第十届核心合作伙伴大会（CPC）在深圳隆重召开。140多家参会合作伙伴齐聚一堂，与华为一起分享了在质量管理上的最新进展。会上，华为轮值CEO徐直军发表了主题演讲，表达了与合作伙伴加大创新合作，共建产业未来的期望。

长飞公司应邀参加本次会议，并获“最佳合作伙伴”殊荣，尤为值得一提的是，长飞公司也是获此奖项的唯一光缆供应商。长飞公司总裁庄丹出席会议并代表公司领奖。

自成立以来，长飞公司本着“以客户为中心，做有责任心的长飞人”的企业核心价值观和“守信用、重操守、担责任、不苟且”的基本行为准则；以“努力实现客户的价值预期”为服务宗旨；以“客户至上、质量先行，以人为本、创新发展”的经营理念；以自身在光通信行业的影响力和履行企业社会责任行为的感召力影响长飞的员工，影响长飞的供应商，影响长飞的客户，影响长飞所有利益相关者，致力于成为一个有责任心的企业。

正如徐直军的发言口号——“众人拾柴火焰高”，未来，长飞公司将与华为以及行业内各企业一起携手共进，共创产业繁荣。

YOFC: “Best Partner of Huawei”

□ Ye Wenjing from Sales Center

On November 15, 2016, the 10th Core Partner Conference of Huawei was held ceremoniously in Shenzhen. Over 140 partners gathered there and shared the latest development in quality management with Huawei. At the conference, on-duty CEO of Huawei, Xu Zhijun delivered a keynote speech, expressing the expectation of enhancing innovative cooperation and building future industry.

YOFC was also invited to this conference and became the “best partner”. What is more, YOFC is the only awarded optical cable supplier. Zhuang Dan, president of YOFC attended the conference and received the award on behalf of the company.

Since its establishment, YOFC adheres to the core value of “customer centered”, basic code of ethics of “credit, ethics, responsibility, conscientiousness”, service principle of “realizing the expectation of customers” and the operation value of “customer foremost, quality based, people oriented and innovation supreme”. Besides, YOFC uses its inßuence in optical communication industry and implementation of social responsibility to affect the staff, suppliers, clients, and stakeholders of YOFC in order to be a responsible enterprise.

Just as the speech of Xu Zhijun “Many hands make light work”, in the future, YOFC will work with Huawei and other enterprises in the industry hand in hand to make our industry more prosperous.

长飞公司
盛装亮相武汉光博会

□ 战略中心 曾云飞

2016年11月3~5日，第十三届“中国光谷”国际光电子博览会暨论坛在武汉国际博览中心隆重开幕。本届光博会以“光联万物，智引未来”为主题，规划了光与制造、光通信、工业自动化及机器人、智慧家庭和产学研五大展馆，其中重点设置了激光光学及红外、3D打印、光通信及移动通信、集成电路、工业自动化及机器人、机器视觉、智慧家庭及智能设备等展区，全面揭示“光联万物”的产业内涵，推动光谷光电产业创新升级。

长飞公司盛装亮相本届光博会，展台以“联接改变生活”为主题，展示了在新型通信光纤、新型光缆解决方案、数据中心综合布线、特种光纤及传感解决方案、消费电子等领域的系列化产品与解决方案，内容丰富的长飞公司综合展示区域吸引了众多嘉宾与观众前来咨询、交流。

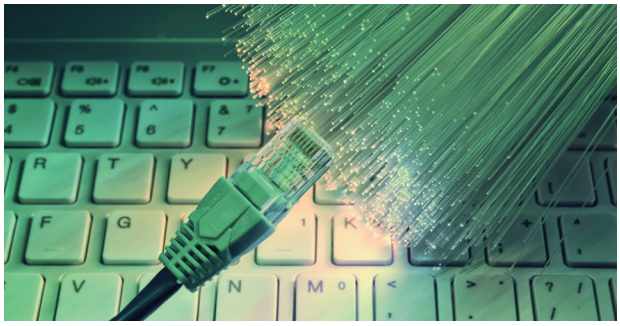
在开幕式后的领导巡展环节，工信部副部长怀进鹏、武汉市市委书记阮成发等领导一行首先来到了长飞公司展台，长飞公司制造中心总经理江志康进行接待。江志康向来访领导介绍了长飞公司整体情况以及本次展览的最新产品，当领导们了解到长飞公司已成为全球第一大光纤预制棒及光纤供应商和全球第二大光缆供应商时，纷纷表示赞许。

YOFC Participates in OVC EXPO

□ Zeng Yunfei from Strategic Center

On November 3-5, 2016, 13th “Optics Valley” of China International Optoelectronic Exposition and Forum grandly opened at Wuhan International Expo Center. This exposition was themed by “Light Links the World, to Lead Our Future with Intelligence”, planning five exhibition halls, including light and manufacturing, optical communication, industrial automation and robots, smart home and industry-university-research cooperation and especially setting up exhibition areas, such as laser optics and infrared, 3D printing, optical communication and mobile communication, integrated circuit, industrial automation and robots, machine vision, smart home and intelligent instrument, etc, so as to comprehensively revealing industrial connotation of “light links the world” and promote the innovation and upgrading of optics valley photovoltaic industry.

YOFC participated in this Expo and its stand is themed by “linkage changes our life”, displaying series products and solutions related to new communication fiber, new optical cable solution, data center wiring, special optical fiber and sensor solution, consumer electronics and other fields. YOFC’s comprehensive stand with rich contents attracted many guests and audiences to have a consultation and communication.



At leaders touring section after opening ceremony, vice minister of the Ministry of Industry and Information Technology Huai Jinpeng, Secretary of Wuhan Municipal Party Committee Ruan Chengfa and other leaders Þrst came to YOFC stand, general manager of YOFC Manufacturing Center Jiang Zhikang received them and introduced to them overall situation of YOFC and the latest products exhibited in this Expo. All the leaders expressed their approval when they learned that YOFC had become the largest optical Þber preform and optical fiber supplier and the second largest optical cable supplier in the world.

长飞公司智能制造成果
精彩亮相第十八届工业博览会

□ 制造中心 何勤国

2016年11月1～5日，第十八届中国国际工业博览会在国家会展中心（上海）隆重开幕。

作为行业内唯一的智能制造试点示范单位，长飞公司的“光纤智能制造试点示范”担负着重要使命。在此次智能制造展区中，长飞公司智能制造模型向观众详细展示了光纤智能制造的全过程。

长飞公司还展示了云制造服务平台、工业大数据平台和数字化虚拟工厂。云制造服务平台是为适应长飞公司由集中制造向全球化、网络化异地制造模式转型而产生的，该平台由应用层、平台层和资源层3部分组成，包括云CRM、云MES、基于USB3.0的AOC云安灯看板系统以及云货运跟踪等核心应用，涵盖了光棒、纤、缆全产业链的业务，成员企业可借助该平台根据需要迅速发现和动态调整合作对象，整合企业间的优势资源，在销售、研发、制造、物流等各个产业链的环节实现全球分布式的协同作业。

工业大数据平台实现工厂智能设备数据采集、存储、查询、分析、挖掘与应用等各项功能，通过工业互联网和物联网以及MES系统能够采集大量的工业数据，是一个覆盖工厂各项生产活动的工业大数据平台。而现场的数字化虚拟工厂让参观者体验到数字化、智能化虚拟工厂的奇妙和智能。体验者对长飞公司取得的智能制造成绩交口称赞。

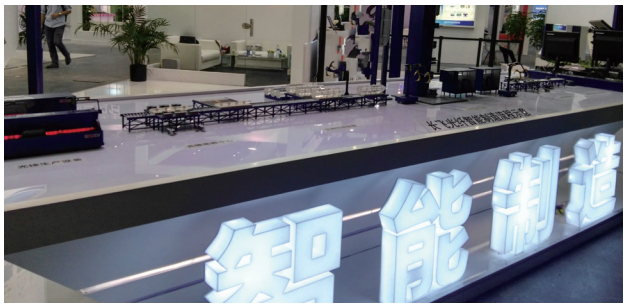
YOFC achievements in intelligent manufacturing splendidly appear at 18th Industry Fair

□ He Qinguo from Manufacturing Center

On November 1-5, 2016, 18th China International Industry Fair grandly opened at National Exhibition and Convention Center (Shanghai).

As the only pilot demonstration unit of intelligent manufacturing in the industry, “pilot demonstration of optical Þber intelligent manufacturing” of YOFC takes on an important mission. At this intelligent manufacturing zone, YOFC’s intelligent manufacturing model showed the whole process of optical Þber intelligent manufacturing to audiences in detail.

YOFC also displayed cloud manufacturing service platform, industrial big data platform and digital virtual factory. Cloud manufacturing service platform is a platform developed in order to adapt to YOFC reform from concentrated manufacturing to global, network-based remote manufacturing mode, consisting of three parts, application layer, platform layer and resources layer, including CRM, cloud MES, USB3.0-based AOC cloud and on kanban system, cloud freight tracing and other core applications, covering the whole industrial chain of optical wand, optical Þber, optical cable.

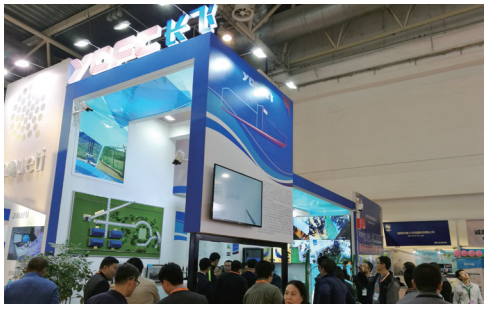


Industrial big data platform realizes the functions, such as data collection, storage, query, analysis, mining and application with factory intelligent equipment and can collect lots of industrial data with industrial internet, internet of things and MES system. It is an industrial big data platform covering all production activities of a factory. On-site digital virtual factory offers a chance to visitors to experience the miracle and intelligence of digital and intelligent virtual factory. All experience people spoke highly of YOFC’s achievements in intelligent manufacturing.

长飞公司携光纤周界安防产品精彩亮相2016中国国际安博会

□ 特种产品事业部 郭江涛

2016年10月25～28日，2016中国国际社会公共安全产品博览会在北京中国国际展览中心隆重举行。长飞公司携全系列光纤传感产品解决方案参加了本次展会，展会上，长飞公司主打的振动光纤周界监测系统解决方案、线性火灾报警系统、大型建筑病害监测系统、电力用全光纤电流互感器系统等多应用场景综合解决方案，吸引了大批行业内外用户前来观摩交流。



长飞公司此次展会重点推出的振动光纤周界监测系统解决方案，采用国际领先的多模干涉技术，利用光纤作为传感器实现分布式周界安防监测，独特设计的传感光缆可围挂、可埋地，能有效、准确地监测入侵行为，以稳定可靠、误报率低等优势处于行业领先地位。该产品目前已通过国家安防产品最高认证，广泛应用于公安司法、石油石化和政府国防等行业。

在长飞展台，来自全国公安司法系统、石油石化、系统集成的专业客户纷纷驻足观看，咨询有关技术和产品问题，现场气氛热烈，交流合作意向踊跃。光纤周界安防产品作为安防行业的新宠，未来也将更好地助力平安中国建设，服务公安消防，促进安防行业健康发展，并不断推动安防行业的技术创新。

YOFC grandly participates in 2016 Security China with optical fiber perimeter security products

□ Guo Jiangtao from Special Products Division

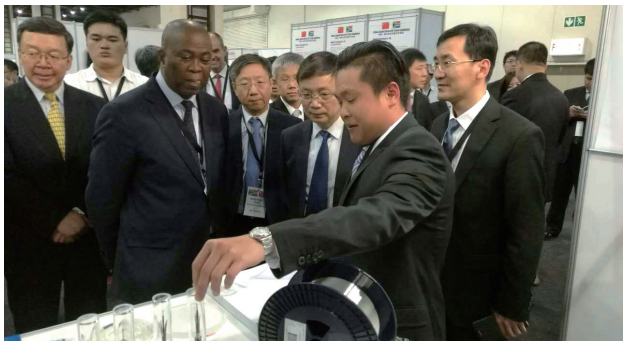
On October 25-28, 2016, 2016 China International Exhibition on Public Safety and Security was grandly held at Beijing China International Exhibition Center. YOFC participated in the fair with full series of optical fiber sensing product solutions. At the fair, vibrant optical Þber perimeter monitoring system solutions, linear Þre alarm system, large building disease monitoring system, full-Þber current transformer for power and other leading integrated solutions to multi-application scenes of YOFC attracted a large number of users inside and outside the industry to make observation and communication.

Vibrant optical fiber perimeter monitoring system solution emphasized by YOFC at this fair adopts internationally advanced multimode interference technology and uses optical fiber as a sensor to realize distributed perimeter security monitoring, and uniquely designed sensing optical Þber, hung or buried, can effectively and accurately monitor infusion actions and possesses a leading industry position with stability, reliability, low false alarm rate and other advantages. This product now has passed the highest national security product certiÞcation and been widely applied in public security, justice, petroleum, petrochemical, government defense and other industries.

At YOFC stand, professional clients from national police and judicial, petroleum and petrochemical and system integration stopped there to observe and consult relevant technical and product problems, creating a warm atmosphere and showing a strong intention to exchange and cooperate. Optical fiber perimeter security product, as the new favorite of security industry, will also better help the construction of safety China, serve public security and Þre protection, promote healthy development of security industry and constantly promote technical innovation of security industry in future.

长飞公司闪耀“中国－南非高技术展示交流会”

□ 战略中心　周钦敏
长飞非洲公司 彭国泰



2016年10月13日，“中国–南非高技术展示交流会”在南非最大城市约翰内斯堡开幕。本次交流会是中国科技部与南非科技部为加强双方高技术交流合作而共同主办的大型科技展会，旨在为双方企业、科研机构等单位搭建对接交流的平台，提供面对面沟通展示的机会，推动两国科技创新合作发展。

本次活动包括科技项目展览、一对一合作洽谈和专题研讨等内容，涉及到生命科学、新能源、环保、电子信息、先进装备制造、中医药等领域，长飞公司作为中国光纤光缆行业内唯一一家受邀企业参展。

开幕式上，中国科技部副部长侯建国、南非科技部总司长PhilMjrawa、中国驻南非大使田学军分别代表两国政府和驻非机构发表重要讲话，表达了双方在高科技领域交流合作的意愿和广阔前景。

展会期间，长飞展台迎来了上述重要领导和省厅领导的莅临，长飞工作人员在介绍长飞公司主要概况的同时，也向领导们汇报了长飞公司在南非投资光缆厂的建设进度。田学军饶有兴趣提起了习主席与祖马总统在南非会晤时特意聊到长飞公司在南非投资的光缆厂，并表达了对长飞在南非开展各项工作的全力支持。

YOFC participates in “Sino-South Africa High-tech Exhibition and Exchange”

□ Zhou Qinmin from Strategy Center
Peng Guotai from YOA

On October 13, 2016, “Sino-South Africa High-tech Exhibition and Exchange” opened in Johannesburg, the largest city in South Africa. This exchange was a large science and technology exhibition co-organized by the Ministry of Science and Technology of the People’s Republic of China and South Africa Ministry of Science and Technology to strengthen their high-tech exchange and cooperation, with a purpose to establish a docking and exchange platform for their enterprises, science research organizations and other units, provide them a chance to make face-to-face communication and display and promote their cooperative development in science innovation.

This activity included science project display, one-to-one cooperation discussion, special topic discussion and other contents and involved life sciences, new energy, environmental protection, electronic information, advanced equipment manufacturing, Chinese medicine and other fields. YOFC attended the fair as the only one invited in Chinese optical Þber and cable industry.

At the opening ceremony, vice minister of the Ministry of Science and Technology of the People’s Republic of China Hou Jianguo, director general of South Africa Ministry of Science and Technology PhilMjrawa and China's ambassador to South Africa Tian Xuejun respectively gave an important speech on behalf of the two governments and the agencies to South Africa, expressing their willingness and wide prospect for high-tech exchange and cooperation.

During the fair, YOFC stand received the above important leaders and provincial department leaders and YOFC staff reported to the leaders YOFC’s construction progress in investing optical cable factory in South Africa while introducing YOFC profile. Tian Xuejun mentioned the optical Þber factory investment in South Africa that President Xi and President Zuma specially talked about at South Africa Conference and expressed his full support for YOFC’s wok in South Africa.

长芯盛携最新VISION AOC大数据远距离解决方案亮相2016斯图加特VISION

□ 长芯盛　陈怡萱

2016年11月8日～11日，斯图加特国际机器视觉展览会VISION在斯图加特隆重举行。

长飞子公司——长芯盛公司携众多产品亮相本次展会，其中长芯盛USB3.0 AOC系列产品在工业相机领域应用广泛，已成为大数据远距离传输的最佳解决方案。

长芯盛拥有IDS、Basler等重磅客户，并且有更多客户主动申请产品测试，期待体验长芯盛AOC系列产品亮点，特别是在此次展会中亮相的USB3.0 Vision有源光纤高柔延长应用线，为工业相机高速传输提供最新解决方案，可直连相机端支持USB3.0 Vision标准，支持500万次坦克链测试，兼容短距离及超长距离传输，成为此次展会的热点，备受业界关注。

长芯盛公司作为“光电转换”专家，承接了威盛电子和长飞公司合资双方在芯片、光纤两大领域的优势，形成了完整的有源光缆产品产业链，相较业内同类型供应商不仅具有很强的技术、制造能力，还具备良好的市场营销竞争力，是目前产品品种最为齐全的有源光缆产品和解决方案供应商。随着“工业4.0”契机的来临，长芯盛将力争为工业视觉领域贡献更多应用方案及集成解决案例，推动国际机器视觉标准的更新与应用。

Everpro participates in Vision Stuttgart 2016 with the latest VISION AOC big data remote solution

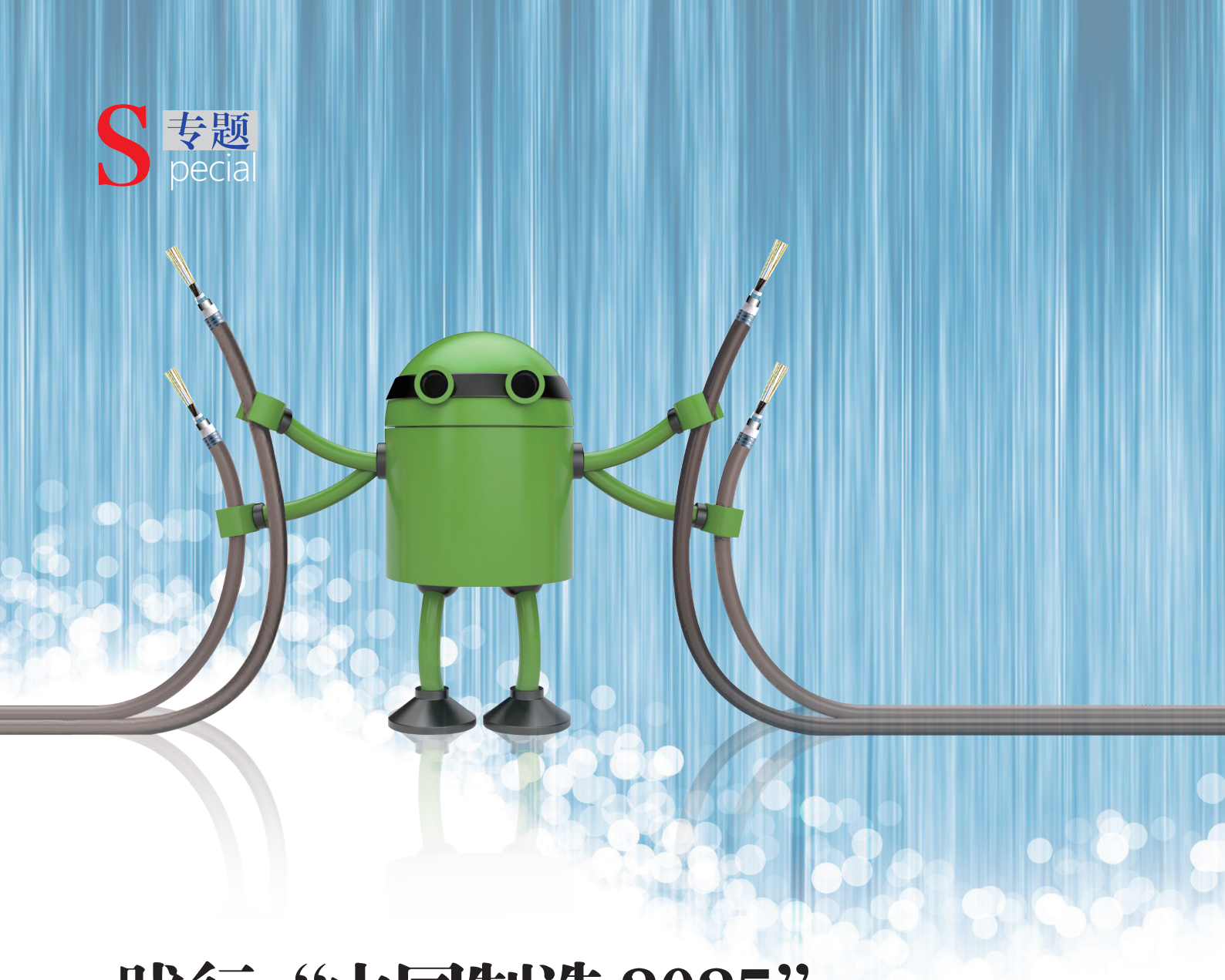
□ Chen Yixuan from Everpro

On November 8-11, 2016, Stuttgart International Trade Fair for Machine Vision grandly opened in Stuttgart.

YOFC subsidiary – Everpro attended this fair with many products, including Everpro USB3.0 AOC series products having been widely applied in industrial camera field and been the best solution to big data remote transmission.

Everpro has IDS, Basler and other giant clients and much more clients take initiative to apply for product testing and look forward to experiencing highlights of Everpro AOC series products, especially USB3.0 Vision ßexible extended application line with active fiber showed at this fair provides the latest solution to high-speed transmission of industrial camera; directly-connected camera, which supports USB3.0 Vision standard and 5-million-time tank chain test and is compatible with short-distance and ultra-long distance transmission, became a hot topic at this fair and drew much attention of the industry.

Everpro, as an expert of “photovoltaic conversion”, inherits VIA Technologies’ and YOFC’s advantages in chip and optical Þber Þelds, forming a complete industrial chain of active optical cable products. Compared with similar suppliers in the industry, it not only has very strong technical and manufacturing capacity, but also has good marketing competitiveness, and it is now a supplier providing the most complete range of active optical cable products and solutions. With the coming of “Industry 4.0”, Everpro will strive to provide industrial vision Þeld with more application programs and integrated solutions and promote the update and application of international machine vision standards.



践行“中国制造2025”
推进工业转型升级

□ 本刊编辑部

2016年11月11日，中宣部联合工信部组织中央主要媒体来到长飞公司进行了“中国制造2025调研行”专题采访。在参观交流中，长飞智能制造理念以及探索实践赢得了大家的交口称赞，尤为值得一提的是，长飞公司现场展示的长飞光纤自动包装流水线、光纤大盘物流等智能制造案例给媒体记者朋友们留下了深刻印象，也备受好评。

央视《新闻联播》、《经济半小时》、《经济信息联播》等栏目陆续聚焦长飞公司智能制造，进行了“中国制造2025调研行”专栏报道；《人民日报》、《经济日报》、《光明日报》、新华网、央广网等媒体分别对长飞公司的智能制造探索进行了权威报道。

长飞公司总裁庄丹表示，长飞一直致力于推动行业的整体进步，未来，公司将在国家智能制造试点示范企业平台的基础上，通过自主创新，提升生产制造智能水平，加强与领先的智能制造企业合作，践行“中国制造2025”，推进工业转型升级。长飞公司从以下四大方面推动企业转型——推进智能制造，助力产业升

级；坚持技术创新，做好动能转换；追求卓越品质，打造国际品牌；围绕战略目标，布局全球市场。

推进智能制造，助力产业升级

长飞公司积极投入智能制造，是首批入围工信部确定的46家智能制造试点示范企业之一，也是中国光纤光缆行业唯一和湖北省唯一的代表。

长飞公司积极探索光纤线缆产业智能制造标准模式，建设智慧工厂，构建一整套光纤光缆行业的智慧工厂解决方案。通过长期智能制造实践，长飞公司创建了智能的五层模型，包括决策层、运营层、执行层、网络控制层和现场层。

2016年1月，长飞公司联合新松机器人和金智信息在湖北潜江建设全新智能工厂，打造预制棒和光纤智能制造行业标准。

长飞公司还将智能技术将广泛应用于集团公司内各大新建工厂，如武汉光谷科技园、长飞公司光纤临安、光纤印尼等项目；同时将各项成功经验向长飞公司技术体系内的天津鑫茂、江苏永鼎、湖北凯乐、山东太平洋等企业输出；长飞公司的智能设备已推广到行业内其他重点企业，包括烽火、特发、永鼎、通光等。

坚持技术创新，做好动能转换

经过二十多年的努力，长飞公司走出了一条技术引进、消化、吸收、创新、输出之路，构建了系统、全面和开放的创新体系和机制，实现了制造型企业的转型升级之路。

长飞公司是全球唯一同时掌握PCVD、OVD和VAD三种预制棒制备技术的公司；还开发了全系列光纤光缆产品和70多种特种光纤产品及应用方案，成为全球行业内产品最全、满足国内需求最广、产业链最长的企业，超低衰减光纤、宽带多模光纤等产品居世界领先水平；承担国家科技重大专项、973计划、863计划、火炬计划、科技支撑计划等国家级项目20余项，荣获省部级以上科技奖励10项，包括“国家科技进步奖”二等奖一项，行业内唯一的企业国家重点实验室也落户长飞公司。

追求卓越品质，打造国际品牌

自成立以来，长飞公司始终坚持“长飞公司制造，质量第一”的发展理念，率先在同行业内构建了以ISO9001质量管理、TL9000通信行业质量管理、ISO14001环境管理、OHSAS18001职业健康安全、SA8000社会责任、ISO17025实验室管理、ISO27001信息安全管理和两化融合八大管理体系为核心的全面管理体系，用全面质量管理进行严格的过程质量管控，持续改进产品和服务的品质。同时，长飞公司也荣获多项国内外质量大奖，正以精益求精的“工匠精神”，塑造长飞公司国际一流的品牌形象，使“长飞公司”成为全球范围内优质光纤光缆产品的第一品牌。

围绕战略目标，布局全球市场

长飞公司依托“一带一路”国家战略，加快了全球化产业布局。在国内，长飞公司科技园投产；长飞公司潜江科技园正在建设中；兰州光缆生产基地辐射中亚，新增产能200万芯公里；沈阳光缆生产基地辐射东北亚，新增产能200万芯公里；浙江联飞将成为浙江省第二大和中国具有影响力的光纤供应商，新增产能1500万芯公里。

在国外，长飞缅甸光缆厂辐射东南亚，新增光缆产能200万芯公里；印尼光纤厂是东南亚首个光纤厂，新增光纤产能300万芯公里；南非子公司将成为非洲地区最具影响力的光缆供应商，新增光缆产能200万芯公里。为了更好地贴近海外客户需求，提升服务质量，长飞公司不断加大了海外销售团队建设。

Practicing Plan of "Made in China 2025" and Promoting Industrial Transformation and Upgrading

☐ The Editorial

The Propaganda Department of the Central Committee of the CPC and the Ministry of Industry and Information Technology of the People's Republic of China jointly organized the major state media organizations to Yangtze Optical Fibre and Cable Joint Stock Limited Company on November 11, 2016 for the special interview of "Made in China 2025 Survey Activity" During the visit and exchange, the concept of intelligent manufacturing and exploration practice of Yangtze Optical Fibre and Cable Joint Stock Limited Company won the appreciation of the audience. It is especially worth mentioning that intelligent manufacturing cases, such as the assembly line of optical fibre automatic packaging and logistics of the optical fibre drums, which were demonstrated on the spot by Yangtze Optical Fibre and Cable Joint Stock Limited Company, left a deep impression on the journalists and also gained favorable comments.

Columns such as the CCTV News, Economy 30 Minutes, Economic News focus on the intelligent manufacturing of Yangtze Optical Fibre and Cable Joint Stock Limited Company in succession, and make special column reports for the "Made in China 2025 Survey Activity"; the People's Daily, Economic Daily, Guang Ming Daily, Xinhua Net, China Broadcast Net, etc., make authoritative reports for the intelligent manufacturing exploration of Yangtze Optical Fibre and Cable Joint Stock Limited Company respectively.

Zhuang Dan, the President of Yangtze Optical Fibre and Cable Joint Stock Limited Company said that they have been committed to promoting the overall progress of the industry; and in the future they will improve the intelligence level of production and manufacturing through independent innovation, strengthen cooperation with leading intelligent manufacturing enterprises and practice the plan of "Made in China 2025" on the basis of the national intelligent manufacturing pilot demonstration enterprise platform, to promote industrial transformation and upgrading. Yangtze Optical Fibre and Cable Joint Stock Limited Company promotes enterprise transformation from the following four aspects: promoting intelligent manufacturing to facilitate industrial upgrading; sticking to technical innovation to perform well in kinetic energy conversion; perusing excellent quality to create international brand; arranging the global market by focusing on the strategic target.

Promoting intelligent manufacturing to facilitate industrial upgrading

Yangtze Optical Fibre and Cable Joint Stock Limited Company is actively engaged in intelligent manufacturing, being one of the first batch of 46 intelligent manufacturing pilot demonstration enterprises determined by the Ministry of Industry and Information Technology of the People's Republic of China and also the only representative in the optical fibre and cable industry of China and in Hubei Province.

Yangtze Optical Fibre and Cable Joint Stock Limited Company actively explores the standard mode for intelligent manufacturing in the optical fibre and cable industry, constructs intelligent factories and builds a full set of intelligent factory solutions for the optical fibre and cable industry. Yangtze Optical Fibre and Cable Joint Stock Limited Company has created five-layer intelligent model through long-term intelligent manufacturing practice, which includes the decision-making layer, operation layer, execution layer, network control layer and field layer.

Yangtze Optical Fibre and Cable Joint Stock Limited Company built the standards for the perform and optical fibre intelligent manufacturing industry in Qianjiang City, Hubei Province through cooperation with SIASUN Robot & Automation Co., Ltd. and Jinzhi Information Co., Ltd in January 2016.

Yangtze Optical Fibre and Cable Joint Stock Limited Company also applies the intelligent technology to various newly-built factories of the group company, for example, the Wuhan Optical Valley Technology Park, Li' nan project of Yangtze Optical Fibre and Cable Joint Stock Limited Company and project of PT yangzte Optical Fibre Indonesia; meanwhile, it also pass on various successful experiences to Tianjin Xinmao Science &Technology Co., Ltd., Jiangsu Etern Co., Ltd., Hubei Kaile Science And Technology Co., Ltd., Shandong Pacific Optics Fiber and Cable Co., Ltd., etc. within the technology system of Yangtze Optical Fibre and Cable Joint Stock Limited Company; intelligent equipment of Yangtze Optical Fibre and Cable Joint Stock Limited Company have been extended to other key enterprises, including Fiberhome Telecommunication Technologies Co., Ltd., Shenzhen SDG Information Co., Ltd., Jiang Su Etern Co., Ltd., Tongguang Group Co., Ltd.

Sticking to technical innovation to perform well in kinetic energy conversion

Through efforts for more than twenty years, Yangtze Optical Fibre and Cable Joint Stock Limited Company has carved out a road of technological introduction, digestion, absorption, innovation and output, established a comprehensive open and systematic system and mechanism and achieved the transformation and upgrading of the manufacturing enterprise.

Yangtze Optical Fibre and Cable Joint Stock Limited Company is the only company in the world that masters three preform preparation technologies (PCVD, OVD and VAD) simultaneously; it also develops whole series of optical fibre and cable products and more than 70 special optical fiber products and application schemes, becoming the company with the most complete products, meeting the most extensive demands, with the longest industrial chain in the world; its ultralow attenuation fiber and broadband multimode fiber, etc., are in a world leading level; it undertakes over 20 national projects, including the key state science and technology projects, 973 plan, 863 plan, China Torch Program, National Sci-Tech Support Plan; it has won ten science and technology awards, including a second class prize for the National Prize for Progress in Science and Technology. The only one national key laboratories of corporation is also in Yangtze Optical Fibre and Cable Joint Stock Limited Company.

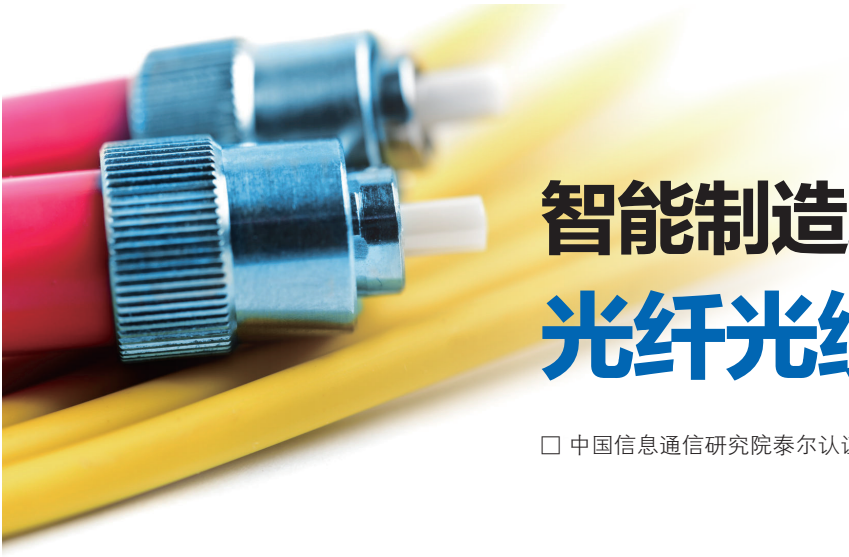
Perusing excellent quality to create international brand

Yangtze Optical Fibre and Cable Joint Stock Limited Company has always been adhering to the development concept of "Yangtze Optical Fibre and Cable Joint Stock Limited Company manufacturing, quality being first" since its establishment. It takes the lead in building the comprehensive management system centered on the ISO9001 quality management system, TL9000 telecom quality management system, ISO14001 environmental management system, OHSAS18001 occupational health and safety system,SA8000 social accountability system, ISO17025 laboratory management system, ISO27001 information security management system and management system for integration of informatization. It conducts strict process quality control with the comprehensive quality management system to continuous improve the quality and service quality. Meanwhile, Yangtze Optical Fibre and Cable Joint Stock Limited Company has also won multiple domestic and international quality awards and they are building world-class brand of Yangtze Optical Fibre and Cable Joint Stock Limited Company by stick to the craftsman spirit of "striving for perfection", to make it the first brand for high quality optical fibre and cable products in the world.

Arranging the global market by focusing on the strategic target

Relying on the national strategy of "One Belt, One Road", Yangtze Optical Fibre and Cable Joint Stock Limited Company has accelerated the global industrial layout. Domestically, its science park is put into operation; its Qianjiang Science Park is under construction; the optical cable production base in Lanzhou radiates to the Central Asia, with a new capacity of 2,000,000 core kilometers; Shenyang Optical Cable Production Base radiates to the Northeast Asia, with a new capacity of 2,000,000 core kilometers; Zhejiang Lianfei Fiber Cable Co., Ltd. will become the second largest optical cable provider in Zhejiang Province and an influential optical cable provider in China, with a new capacity of 15,000,000 core kilometers.

Internationally, its optical cable plant in Myanmar radiates to the Southeast Asia, with a new capacity of 2,000,000 core kilometers; its optical cable plant in Indonesia is the first optical cable plant in the Southeast Asia, with a new capacity of 3,000,000 core kilometers; its subsidiary in South Africa will become the most influential optical cable provider in the Africa, with a new capacity of 2,000,000 core kilometers. To better cater for overseas customers and improve service quality, Yangtze Optical Fibre and Cable Joint Stock Limited Company has constantly intensified the building of overseas sales team.



智能制造助推
光纤光缆行业转型升级

□ 中国信息通信研究院泰尔认证中心副总工 郑永亮

近年来，我国光纤光缆行业取得了长足发展，形成了涵盖光纤预制棒、光纤、光缆生产的完整产业链，光纤光缆的产能也在不断增长。同时由于业内普遍看好未来几年内5G技术应用以及IP流量（特别是视频流量）增长对光纤光缆行业带来的市场前景，故此预测未来几年内国内光纤光缆产能还可能会进一步增加。

目前部分国内光纤光缆行业的龙头企业已经未雨绸缪，从产品研发、工艺创新、管理创新等方面入手，积极着手实施智能制造，以便应对国内市场未来的产能过剩、同时进一步提升产品在国际市场上的竞争力。

光纤光缆行业智能制造发展现状

与石化、钢铁、汽车等行业相比，光纤光缆行业的信息化建设起步较晚。IT方面主要集中在部分信息系统的单项应用，目前国内光纤光缆企业已经普遍应用了财务、ERP等系统，部分企业已经部署了MES、PDM、OA等系统，极少数企业已将仿真技术应用到了产品和工艺的开发并建立了数据仓库，实现了ERP、MES与工控系统的集成；OT方面主要集中在设备的自动化、数字化改造，目前国内光纤光缆企业关键生产和检测设备的单机数字化率已经基本接近100%，其中少数企业开始实施了设备的网络化改造和数据的自动采集分析，并探索在此基础上借助IT技术与OT技术的融合应用来实现集中监测、精准控制、精细管理和决策优化。

光纤光缆行业智能制造实施路径

光纤光缆行业智能制造的建设思路可以概括为：以工业物联网为基础，以数据采集利用为手段，以管理创新为核心，以精益化、柔性化制造为目标，以集成和协同为方向，最终构建如图所示，以“三大集成”为基础的智能制造体系。

（一）部署工业物联网，实现工业大数据自动化采集和设备集中监控

当前从自动化到数字化、网络化、智能化的设备技术改造路线已经得到了普遍认同，而网络化到智能化更是从工业3.0迈向工业4.0的关键前提条件之一。对于光纤光缆行业，目前已经基本实现了自动化和数字化，下一步需要做的就是设备网络化改造，包括充分利用数字化设备的通信接口、在自动化设备上加装传感器和控制器，并因地适宜地利用有线或无线网络接入技术，建设覆盖全工序、全流程的各类生产、检测、物流设备的工业互联网，充分采集制造过程中产生的大量数据和图像信息，从而为设备的集中监视、远程控制、协同制造创造条件。

（二）打通信息纵向集成通道，构筑数字化制造基础

目前光纤光缆企业在实施智能制造方面最大的障碍是从底层设备到生产运营层再到企业经营决策层之间的数据和信息的传递通道没有打通，无法基于工业大数据的分析实施生产运营的精细化管控和企业资源的统一协调和优化。为此需要大力推广MES制造执行系统的部署和应用，并通过ESB服务总线和企业数据仓库，打通设备层、经营层、决策层之间信息纵向集成的通道，为工业大数据的开发利用构建基础。

（三）导入先进管理理念，提升企业集成化、精益化、柔性化制造能力

实施设备网络化改造、提高数据自动采集率、部署工业软件、开展物理系统与信息系统的集成等措施的最终目的，不仅是为了提高生产自动化水平、实现机器换人，而是以优化生产

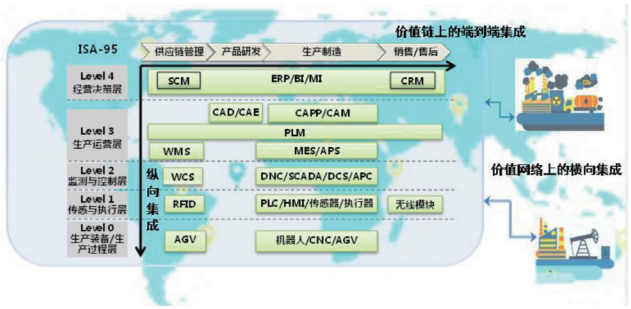


图 以“三大集成”为基础的智能制造体系

节拍、提高生产效率、降低库存、控制成本浪费、提升产品质量为核心，全面推行精益生产等先进管理理念，提升企业集成化、精益化、柔性化制造能力。

（四）整合企业内外部资源，实现价值网络上的集成和协同

智能制造的核心在于借助CPS信息物理系统，充分运用自动化、信息化、互联网、物联网、人工智能等先进技术，把企业的设备、生产线、物料、员工、供应商及客户紧密联系在一起，把数据作为一种新型的生产要素进行全面管理和深化应用，全面推进业务流、资金流、物流中信息的数字化、网络化、集成化的发展，并不断提升从数据到信息再到知识全过程的自动化采集、处理、分析和利用的水平，从而优化企业资源配置、提高管理效率、提升企业竞争力，为客户提供差异化、端到端的生产和服务。

管理创新是智能制造核心

智能制造是信息化与工业化的深度融合，它不仅是先进的IT、OT等技术的引进和创新，更是企业管理的创新和模式的创新。回顾改革开放三十年来国内制造企业的转型升级之路，应该说自动化、信息化建设得到了快速发展，但从全球竞争市场来看，仍然存在高端产能不足、中端产能过剩、低端产能竞争优势减弱等问题。

虽然这当中的原因有很多，但企业强调技术而忽视管理，关注经济效益指标而忽视管理绩效指标等也是造成这个结果的主要原因之一。

例如，大量企业都部署应用了ERP系统，但真正能借助该系统实现业务流程整合、资源配置优化的并不多见。究其原因，主要在于多数企业把ERP看作仅是一个信息化工具加以应用，而没有真正理解蕴含其中的流程化管理思想。系统导入前没有进行充分的业务流程优化或业务流程再造，仅仅基于现实的做法用电子化手段代替了原来的人工录入、审批和统计等工作，在整个业务流程上部门间的壁垒没有被彻底打破，不增值、冗余的流程环节依然存在，流程本身的效率并没有得到充分优化和提升。因此说技术创新是智能制造的基础，但管理创新才是智能制造的核心。

Intelligent Manufacture Boosting Transformation and Upgrading of Optical Fibre & Cable Industry

□ Zheng Yongliang from the Assistant Chief Engineer of TTL CertiÞcation Center of China Academy of Information and Communications Technology (CAICT)

In recent years, Chinese optical Þbre & cable industry has been developed a lot; a complete industry chain covering production of optical Þbre performs, optical Þbres and cables is established; and the productivity of optical fibres and cables is increasing continuously. In addition, people in the industry are generally optimistic about the market prospect of the optical fibre & cable industry prompted by application of 5G technology and increase of IP flow (especially video traffic) in the near future years. It predicates that the productivity of optical Þbres and cables in China will further increase.

At present, some leading enterprises of the optical Þbre & cable industry in China have planned ahead, been devoted to product research and development, process innovation and management innovation and actively implemented intelligent manufacture, so as to respond future excess capacity in the domestic market and further improve the product competitiveness in the international market.

Development Status of Intelligent Manufacture of Optical Fibre & Cable Industry

Compared with the petrochemical industry, steel

industry and automobile industry, information construction of the optical fibre & cable industry starts relatively late. For IT aspect, information construction mainly focuses on individual application of some information systems. At present, most optical fibre & cable enterprises in China have applied the financial system and ERP system, some enterprises have applied MES, PDM and OA systems and a very few enterprises have applied the emulation technique to development of product and process, established data warehouses and achieved integration of ERP, MES and project control system. For OT aspect, information construction mainly focuses on automation and digitized transformation of equipment. At present, the single-machine digitization rate of key production and inspection equipment of optical fibre & cable enterprises in China has been up to 100% basically; and a few enterprises have carried out network transformation of equipment and automatic data collection and analysis and explored to achieve central monitoring, precise control, refined management and decision optimization through combined application of IT technology and OT technology on this basis.

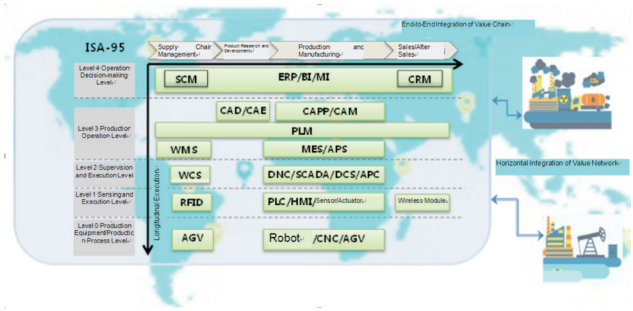


Figure Intelligent manufacture system based on the "three major integrations"

Implementation approach for intelligent manufacture in optical fibre and cable industry

The construction thoughts for intelligent manufacture in optical fibre and cable industry can be summarized as: it takes the industrial internet of things as the foundation, data acquisition and application as the method, management innovation as the core, lean and flexible manufacture as the goal, integration and coordination as the direction to finally construct the intelligent manufacture system based on the"three major integrations", as shown in the Þgure below.

(I) Employment of industrial internet of things to implement the automatic acquisition of industrial big data and centralized monitoring of equipment

The technical transformation route of equipment from automation to digitization, networking and to intelligentization has been commonly accepted, and the progress from networking to intelligentization is one of the key preconditions for development from 3.0 to 4.0. At present, the optical Þbre and cable industry has basically achieved the automation and digitization, and the next step is the networking transformation of equipment, including taking full advantage of the communication interface of digital equipment, installing sensor and controller on automation equipment, introduction of technology befittingly through wired or wireless network, constructing industrial internet of things that covers the whole process and ßow for various production, detection and logistics equipment, sufficiently collecting the mass data and image information generated during the manufacture, so as to create conditions for the centralized monitoring, remote control and collaborative manufacturing of equipment.

(II) Connecting vertical integration channel of information and constructing digitized manufacturing foundation

At present, the biggest obstacle for optical fibre and cable enterprises in the implementation of intelligent manufacture is that the transmission channel for data and information from bottom facility to production & operation level and then to enterprise operation decision-making level is not connected, thus unable to conduct the delicacy management of production & operation and unified coordination and optimization of enterprise resources based on the analysis of industrial big data. Therefore, it is necessary to popularize the employment and application of manufacturing execution system (MES) and to connect the vertical integration channel of information from equipment level to operation level and to decision-making level through ESB service bus and enterprise data warehouse, so as to construct foundation for the development and application of industrial big data.

(III) Introduction of advanced management concepts and improvement of the integrated, lean and ßexible manufacturing capacity of enterprise

The ultimate purpose of measures as implementation of equipment networking transformation, improvement of automatic data acquisition rate, employment of industrial software and the integration of physical system and information system is not only to improve the automatic production level and achieve the substitution of men by machines, but to take the optimization of production beat, improvement of production efficiency, cutting inventory, control of cost waste and improvement of product quality as the core, so as to comprehensively implement the advanced management concepts as lean production, and to improve the integrated, lean and flexible manufacturing capacity of enterprise.

(IV)Integration of the internal and external resources of enterprise, achievement of integration and coordination on value network

The core of intelligent manufacture is to take full advantage of the advanced technologies as automation, informatization, internet, internet of things and artificial intelligence with the help of cyber-physical system (CPS) to connect equipment, production lines, material, employees of enterprise, supplier and the client closely, conduct comprehensive management and further application of data as a new production factors, comprehensively promote the development of the digitization, networking and integration of information in business flow, capital flow and logistics, and continuously improve the capability of automatic acquisition, processing, analysis and application in the whole process from data to information and then to knowledge, so as to optimize the resource allocation of enterprise, improve the management efÞciency, enhance the enterprise competitiveness, and to provide differentiated, end-to-end production and service.

Management innovation is the core of intelligent manufacture

Intelligent manufacture is the deep integration between informatization and industrialization. It is not only the introduction and innovation of advanced IT, OT technologies, but also the innovation of enterprise management and industry model. Review the transformation and upgrading of domestic manufacturing enterprises over 30 years since the reform and opening-up, it should to say that the construction of automation and informatization experienced a rapid development, but from the perspective of global competitive market, there are still problems on insufficient high-end capacity, excess middle-end capacity, competitive edge reduction of low-end capacity.

Although there are many reasons for this, the enterprise emphasis on technology and neglect on management as well as the attention to the economic beneÞt indicators and neglect on management performance indicators is also one of the main reasons for such result.

For example, a large number of enterprises deployed and applied ERP system, but not many achieved the business process integration and resource allocation optimization with the help of such system. The main reason is that most enterprises take ERP system only as an information tool, and they don't truly understand the process management concept implied within. They didn't conduct sufficient business process optimization or business process reestablishment before system implementation, but simply replaced the original works as manual entry, examination and approval and statistics with electronic means based on realistic practice. During the whole business process, the barriers among departments were not complete broken, and the non-value added and redundant process links were still existing, and the process efÞciency was not fully optimized and improved. Therefore, the technical innovation is the foundation of intelligent manufacture, but management innovation is core of intelligent manufacture.

初探水线光缆的生产

□ 长飞中利公司　黄勤 包耀文

水线光缆相比陆上光缆，具有适合海岸边上、浅水中安装，无需中继，易于安装和维护，且具有优良的机械性能等特点。优良的机械性能保证了水线光缆具有高的抗拉、抗压性能，能经受被锚、渔具等牵钩时受到的张力。水缆按照类型划分可以分为GYTA33、GYTS33、GYTA333、GYTS333等，33型表示在护套外施加一层细圆钢丝，333型表示在护套外施加2层细圆钢丝，然后在铠装层外施加一层聚乙烯护套。GYTA33型水线光缆如图所示。

单从水线光缆结构看，该缆型结构并不复杂，但关键工序应区别于普通光缆，从原来的光纤松套管工序转移到钢丝绞合工序，钢丝绞合质量直接影响着整个产品的质量。本文就水线光缆钢丝铠装机器设计、水线光缆的结构设计以及具体生产实施中出现的问题解决逐一阐述。

1. 钢丝铠装机的设备组成

长飞中利公司结合现有钢丝铠装机的结构特点，提出适合水线光缆的技术指标，该项目对设备厂家也是一个挑战。

1.1 半成品光缆放线技术指标

原有钢丝铠装放线适用于Φ800mm盘具，显然不适用于光缆半成品放线使用。所以半成品放线装置采用地轨式龙门结构，采用主动放线。放线盘具尺寸：PN800～1600mm；放线盘最大重量：3000kg。

1.2 绞笼技术指标

绞笼是本设备的关键装置，我们现存的钢绞设备一个绞笼上可装18个PN400的线盘，即18个放线头，这样会限制生产水线光缆的生产规格，所以我们设计2台18个放线头的绞笼串联方式。

1.3 双轮牵引机技术指标

牵引轮直径：Φ1250mm

牵引力：800kg

牵引速度：5～80m/min

1.4 收线张力装置技术指标

摆杆式结构，放线张力为10～100N

1.5 Φ1800mm地轨龙门收排线架

我们采用1800mm盘具适用收线架，以适应水线光缆长度和外径，最大收线重量为3000Kg。

2. 水线光缆的结构设计

水线光缆在敷设使用时需要承受很大的拉力，需要把光缆进行钢丝铠装以满足抗拉强度，水线光缆的抗拉强度主要由铠装钢丝提供，光缆中心加强件只是起到辅助作用。

铠装钢丝根数的计算方法一：我们可以根据客户需求的抗拉张力来确定铠装钢丝根数，由铠装钢丝的杨氏模量和拉伸窗口来计算，公式1如下：

$$M = \frac{F}{\pi R^2 \varepsilon E}$$ 公式1

其中F为要求的拉力数值，ε为光缆的拉伸窗口，E为铠装钢丝杨氏模量，R为铠装钢丝的半径，M为铠装钢丝的根数。

本文涉及的水线光缆是层绞式光缆，光纤松套管以螺旋方式绞合到中心加强件上，这时光纤形成一个拉伸窗口ε拉，公式2如下：

$$\varepsilon_{拉} = \left\{1 - \frac{\sqrt{[(d + 2\delta + 1.16 \times \sqrt{n} \times d_f)\pi]^2 + h^2}}{\sqrt{[(D + d)\pi]^2 + h^2}}\right\} \times 100\%$$ 公式2

其中d为中心加强芯直径；D为松套

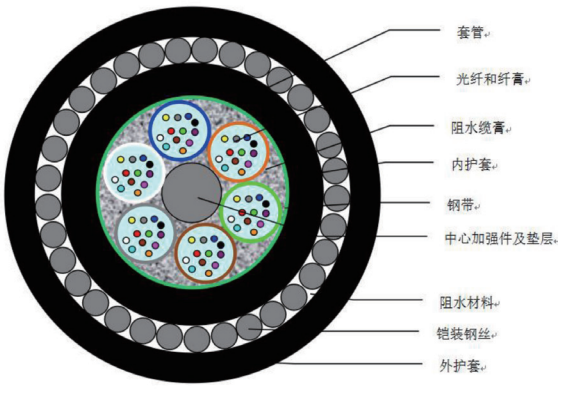
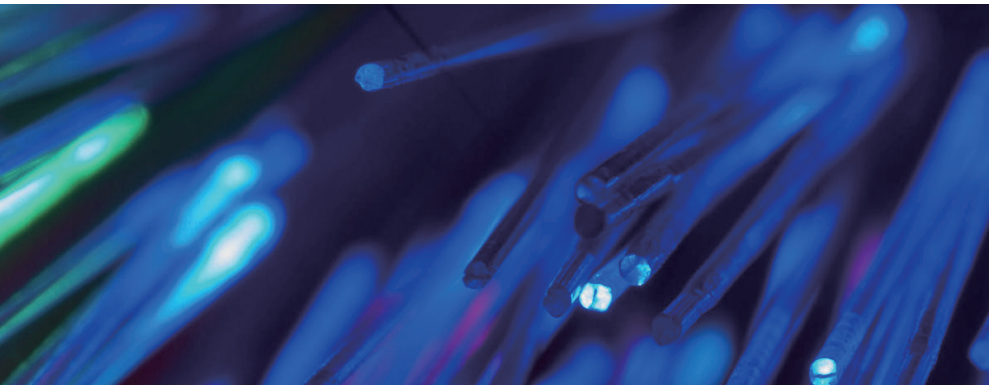


图 GYTA33 水缆结构图



管外径；δ为松套管壁厚；n为松套管光纤芯数；为光纤外径；h为绞合节距。当光纤松套管生产时，会产生一次余长松套管余长ε松，所以ε=ε拉+ε松。

铠装钢丝根数的计算方法二：根据钢丝屈服强度和要求的拉力决定，公式3如下：

$$M=\frac{F}{\pi R^2 K}$$ 公式3

其中k为铠装钢丝杨氏模量对应的强度，F为要求的拉力数值，R为铠装钢丝的半径，M：铠装钢丝的根数。

铠装钢丝根数的计算方法三：根据光缆的结构尺寸来决定铠装钢丝根数，公式4如下：

$$A=\frac{\pi(D+d)}{d}$$ 公式4

其中d为铠装钢丝的直径，D为内护缆的外径。

在上述计算方法中，前两种计算方法都是通过铠装钢丝的材料性能参数来计算，在材料性能参数准确的情况下，计算结果的准确性可以得到保证。第三种计算方法是在内护缆外径和铠装钢丝直径确定后计算，计算结果可以和前2种办法相比较，来验证铠装钢丝的数量是否满足要求。

3. 水线光缆的生产

3.1铠装

水线光缆的实际生产中，钢丝绞合质量直接影响到光缆护套的质量。生产水线光缆，其钢丝绞合质量直接影响到光缆护套的质量。

3.2铠装钢丝长度

最好做到铠装钢丝长度一致，如果钢丝长度相差较大，钢丝重量不一致，会造成绞笼运转时不稳定。

3.3铠装钢丝放线

钢丝放线张力必须合适，并且几十个钢丝盘放线张力必须恒定，张力调节可以采取张力皮带来调节。钢丝绞合张力均匀非常重要，铠装绞合不服贴的光缆在护套时，会出现外观差，严重时产生灯笼状而塞断光缆。

3.4钢丝预变形

预变形的目的是消除钢丝绞制时的弹性应力和残余应力，如不能消除可能会引起绞制后缆芯中光纤损耗的增加，主要是直径较大铠装钢丝绞合时使用。单丝不会朝绞合相反的方向松散开，常用的变形器为柱状变形器。

正确选择预变形的工艺参数，是钢丝铠装质量的主要保证，单丝的弯曲或变形程度以单丝的变形率表示，见如下公式5。

$$y=\frac{dr1}{dr}\times 100\%$$ 公式5

其中y为变形率%，dr1为单丝变形后弯曲直径，dr为光缆的直径。y=100%是理想状态，在实际生产中，一般控制变形率为95%～100%之间。

3.5 绞合模具

铠装钢丝绞合模具比较简单，要注意绞合模具的大小必须合适，太大的模具会出现跳丝，太小的模具会出现塞断。

3.6 内护套生产

生产内护层时需要注意护套材料与纵包轧纹钢带结合的紧密性，以保证阻水能力，需注意控制挤出质量，外径均匀圆整，以保证电绝缘性能及方便下道钢丝铠装工序的生产，特别要注意内护套的直径必须与计算绞合钢丝根数相符合。

3.7 外护套生产

外护套生产采用挤压式模具，注意调节模芯和模套的间隙，保证足够的出料压力。

4.10000N 拉力水线光缆生产

4.1 10000N水线光缆结构参数

我们接到的任务是生产GYTS33-48B1.3水线光缆，按照某运营商标准规范，光纤松套管按照2.4mm管12芯，中心加强芯为1.7mm磷化钢丝。一次余长0.2‰～0.6‰，由公式（2）可得ε拉=0.39%。根据铠装钢丝绞合圆整度及设备配置，选用1.0mm镀锌低碳钢丝，由公式（4）可得钢丝根数为31根，接着完成钢丝铠装及护套挤制。

4.2 成品机械性能实验结果，见表1

表1 机械性能表

	长期	短期
拉力（N）	4000	10000
压扁力（N/100mm）	3000	5000
结果	合格	合格

5. 结论

历经铠装设备定型、工艺调试等工作，长飞中利初具生产10000N水线光缆产品的能力，丰富了产品类型。同时我们也在加大光缆新品开发力度，扩宽产品系列来满足客户需求。

Preliminary Studyon Production of Underwater Cable

☐ Huang Qin and BaoYaowen fromYOFC (Jiangsu)

In this paper we describe the underwater cable design and production.compared with terrestrial cable, underwater cable is characterized by being fit for installation off the coast and in shallow water, dispensing with relay, easy to install and maintain and excellent mechanical properties. Excellent mechanical properties ensure that underwater cable has high tensile resistance and high compression resistance, and can withstand tensile forcecaused by dragging and pulling by anchorage and fishing gear, etc. Underwater cables can be divided into GYTA33, GYTS33, GYTA333, GYTS333, etc. by type. Model 33 indicates that one layer of thin and round steel wire is outside the sheath. Model 333 indicates that two layers of thin and round steel wire are outside the sheath and one layer of polyethylene sheath is outside the armor layer. Model GYTS33 underwater cable is as shown in Fig..

From the aspect of structure of underwater cable, this cable is not structurally complex. Critical process of this cable type shall be different from that of ordinary cable. The original secondary coating process transfers to steel wire stranding process. Quality of steel wire stranding directly affects quality of the product. This paper elaborates on design of armoring machine of steel wire of underwater cable, structural design of underwater cable and solutions of problems arising from specific production.

1.Steel Wire Armoring Machine

Based on structural features of existing steel wire armoring machine, Yangtze Zhongli puts forward technical indicators suitable for underwater cable. This project is a challenge for equipment manufacturer.

1.1 pay-off

The original steel wire armoring pay-off is applicable to Φ800mm drum, and is obviously not applicable to cable core. As a result, the pay-off device for cable is of the ground rail type gantry structure, and active paying off is adopted. Size of drum: PN800-1600mm; maximum weight of drum: 3000kg.

1.2 stranding cage

Stranding cage is a critical device for this equipment. 18 PN400 drum barrels can be installed to one stranding cage of our existing steel stranding equipment, namely 18 pay-off heads, which would limit

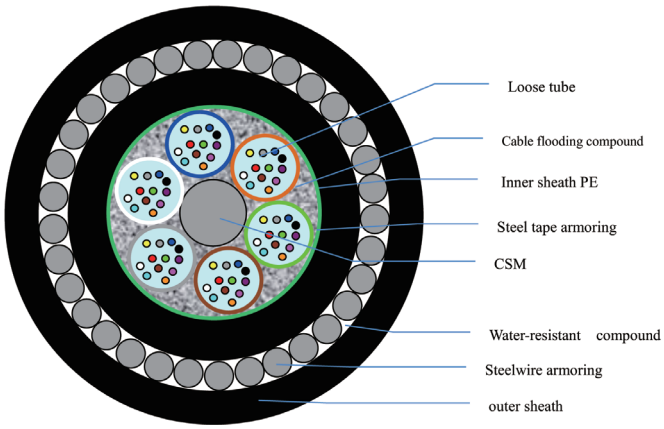


Fig. Structural drawing of GYTS33 underwater cable

production speciÞcation of underwater cable. Therefore, we design the series mode of two stranding cages with 18 pay-off heads.

1.3 two-wheel Caterpillar

Diameter of traction wheel: Φ1250mm

Caterpillar force: 800kg

Caterpillar speed: 5-80m/min

1.4 take-up tensile force device

Swing-rod structure, take-up tensile force of 10~100N

1.5 Take-up and creel stand for Φ1800mm ground rail gantry

We use the take-up stand applicable to 1800mm drum to adapt to length and diameter of underwater cable. The maximum take-up weight is 3000Kg.

2.Structural Design of Underwater Cable

During Installation and Operation, underwater cable has to bear very large tension. So, cable needs to be armored to meet tensile strength. Tensile strength of underwater cable is mainly provided by the armored steel wire, and the csm of cable just plays a supplementary role.

Computing method I for number of armored steel wire: we can determine the number of armored steel wire according to tensile force required by the customer. Calculation is based on the Young's modulus and tensile window of armored steel wire. Formula 1 is as follows:

$$M = \frac{F}{\pi R^2 \varepsilon E} \qquad \text{Formula 1}$$

Wherein, F is required tension, ε is the tensile window of cable, E is the Young's modulus of armored steel wire, R is the radius of armored steel wire and M the number of armored steel wire.

Underwater cable referred to herein is the layer-stranding cable, loose tube is stranded to the central reinforcer in spiral mode. At this time, the cable forms a tensile window $\varepsilon_{tension}$. Formula 2 is as follows:

$$\varepsilon_{tension} = \left\{1 - \frac{\sqrt{[(d + 2\delta + 1.16 \times \sqrt{n} \times d_f)\pi]^2 + h^2}}{\sqrt{[(D + d)\pi]^2 + h^2}}\right\} \times 100\%$$

Formula 2

Wherein, d is the diameter of central reinforcing core, D is the outer diameter of loose tube; δ is the wall thickness of loose tube; n is the number of Þber cores of loose tube; is the outer diameter of cable; h is the stranding pitch. In the course of production of Þber loose tube, primary excess length , the excess length of loose tube, will be generated. So , $\varepsilon = \varepsilon_{tension} + \varepsilon_{loose}$.

Computing method II for number of armored steel wire: computing based on yield strength of steel wire and required tension. Formula 3 is as follows:

$$M = \frac{F}{\pi R^2 K} \qquad \text{Formula 3}$$

Wherein, k is the strength corresponding to Young' modulus of armored steel wire, F is the required tension, R is the radius of armored steel wire, and M is the number of armored steel wire.

Computing method III for number of armored steel wire: determine the number of armored steel wire according to structural dimensions of cable. Formula 4 is as follows:

$$A = \frac{\pi(D + d)}{d} \qquad \text{Formula 4}$$

Wherein, d is the diameter of armored steel wire, and D is the outer diameter of inner sheath.

Among the above computing methods, the first two are based on parameters of material properties of armored steel wire. Under the condition that parameters of material properties are correct, correctness of computing results can be ensured. The third computing method is based on determination of outer diameter of inner sheath and diameter of armored steel wire. Results can be compared with those of the first two to verify whether number of armored steel wire meet requirements.

3.Production of Underwater Cable

3.1 Steel wire Armored

During actual production of underwater cable, quality of steel wire stranding directly affects quality of cable sheath. As for production of underwater cable, quality of steel wire stranding directly affects quality of cable sheath.

3.2 Length of armored steel wire

It is preferred that armored steel wires are consistent in length. Large difference in steel wire length and different steel wire weights would cause instable operation of stranding cage.

3.3 Armored steel wire pay-off

Tensile force of steel wire pay-off must be appropriate, and that of dozens of steel wire drums must be constant. Tensile force adjustment may be achieved via tension belt. Even tensile force of steel wire stranding is very important. During installation of sheath, cable subject to poor armor

stranding would suffer from poor appearance, and result in lantern shape when serious which leads to cable breakage.

3.4 Predeformation of steel wire

The aim of predeformation is to eliminate elastic stress and residual stress generated during steel wire stranding. Failure to eliminate such two might cause increase in loss of fiber in the cable core stranded. Predeformation is mainly applied to stranding of armored steel wire with a large diameter. Single wire would not loose towards the direction opposite to stranding.The commonly used deformer is columnar deformer.

Correct selection of process parameters of predeformation is an important means to ensure steel wire armoring quality. Degree of bending or deformation of single wire is expressed by deformation rate of single wire. See Formula 5 below.

$$y = \frac{dr1}{dr} \times 100\% \quad \text{Formula 5}$$

Wherein, y is the deformation rate (%), dr1 is the bending diameter of single wire after deformation, dr is the diameter of cable. y=100% is the ideal state. In actual production, deformation rate is generally controlled within 95%~100%.

3.5 Stranding die

Stranding die of armored steel wire is relatively simple. Attention shall be paid to the size of stranding die. Too large die would cause wire skipping while too small die would cause breakage.

3.6 Quality of inner sheath

During production of inner sheath, attention shall be paid to the tightness of sheath material and longitudinally wrapped rolled steel tape to ensure the water-resisting ability. Attention shall be paid to controlling the extrusion quality. The diameter shall be uniform and round, so as to ensure electrical insulation property and facilitate implementation of next process, steel wire armoring. Special attention shall be paid to correspondence between diameter of inner sheath and calculated number of stranded steel wire.

3.7 Production of outer sheath

Outer sheath is produced with extrusion die. Attention shall be paid to adjusting the gap between point core and die sleeve to ensure enough discharge pressure.

4.Production of Underwater Cable with 10000N Tension

4.1 Structural parameters of 10000N underwater cable

Our task is to produce GYTS33-48B1.3 underwater cable. According to standard specification of certain operator, 2.4mm loose tube with 12 fiber, the csm is 1.7mm phosphatized steel wire. The primary excess length is 0.2‰ -0.6‰ . It can be known from Formula (2) that εtension=0.39%. According to roundness of armored steel wire stranding and equipment conÞguration, 1.0mm galvanized low-carbon steel wire is selected. It can be known from Formula (4) that the number of steel wires is 31. The next step is steel wire armoring and sheath extrusion.

4.2 Refer to Table 1 for experimental results of mechanical properties of Þnished product.

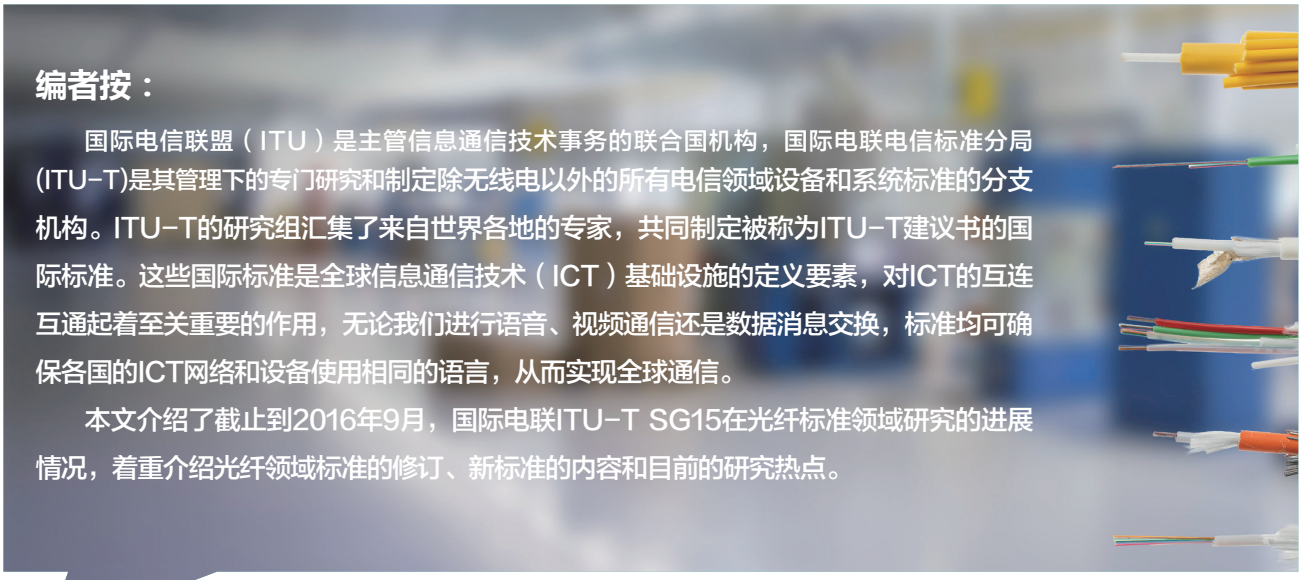
We have tested performance of Underwater cable for various tests. We found that the cable is passing all required criteria of speciÞcation.

5.Conclusion

Having experienced Þnalization of design of armoring equipment, process debugging, etc., Yangtze Zhongli's capacity of producing 10000N underwater cable begins to take shape, and product types are enriched. Meanwhile, we are intensifying development of special cable products to meet customer needs.

Table 1 Mechanical properties

	Long-term	Short-term
Tension (N)	4000	10000
Crush (N/100mm)	3000	5000
Result	Qualified	Qualified



编者按：

国际电信联盟（ITU）是主管信息通信技术事务的联合国机构，国际电联电信标准分局(ITU-T)是其管理下的专门研究和制定除无线电以外的所有电信领域设备和系统标准的分支机构。ITU-T的研究组汇集了来自世界各地的专家，共同制定被称为ITU-T建议书的国际标准。这些国际标准是全球信息通信技术（ICT）基础设施的定义要素，对ICT的互连互通起着至关重要的作用，无论我们进行语音、视频通信还是数据消息交换，标准均可确保各国的ICT网络和设备使用相同的语言，从而实现全球通信。

本文介绍了截止到2016年9月，国际电联ITU-T SG15在光纤标准领域研究的进展情况，着重介绍光纤领域标准的修订、新标准的内容和目前的研究热点。

光纤标准新进展

□ 研发中心 李婧

1．引言

ITU-T第15研究组制定的国际标准（ITU-T建议书）详细规定了构建全球通信基础设施技术规范。该组制定的标准定义了实现长途全球信息交换的光传输网络技术和架构、用户连接使用的光纤或铜缆接入网络，以及连接室内设备并与外部世界连接的家庭网络。

ITU-T第15研究组的Q5课题负责光纤光缆特性及其测量方法相关标准的研究和制修订工作。

2．光纤标准研究进展

ITU-T第15研究组第5课题（SG15/Q5）在2013～2016研究期共召开了六次会议，主要围绕着G.652、G.654、G.657、G.650.1、G.650.2、G.650.3以及新的增补文件G.sup.fcr展开讨论，重点在于G.652、G.654、G.657这三个产品标准建议的讨论。在ITU-T SG15研究组2016年9月的会议上，Q5顺利完成了ITU-T Rec.G.652、G.654、G.657和G.sup.59（G.sup.fcr）这四个建议新版本的审批发布。

2.1 ITU-T Rec.G.652最新版本主要修订内容

本次修订没有新增光纤类别，主要的修订内容集中在G.652.D的指标：色散、模场直径、几何参数的指标均不同程度的进行了缩紧。而G.652.B的指标与上一版本维持不变。

ITU-T Rec.G.652的2016版相比2009年版主要有以下修订内容：

a) 新版本中删除了G.652.A和G.652.C的两个表格，由于这两类光纤在现阶段很少使用、几乎没有，因此在新版本中删除了对应表格，但备注了一句：如果需要使用可以参考2009年版本的表格1和表格3；

b) 增加了第五章“约定”，其中说明了修约规则，“数值应先修约到与表格中的指标位数一致，再进行比较。修约采用四舍五入的方法，该方法的描述可以在ISO 80000-1的Annex B，Rule B中找到。”；

c) 对G.652.D光纤的色散指标进行了修订：

新的色散系数为一定波长范围内的上下限区域指标，而非上一版中仅对零色散波长和零色散斜率进行规范；

新的色散指标，波长范围为1260nm～1625nm，界限为1460nm，1460nm以下采用三阶Sellmeier拟合，1460nm以上采用线性拟合。同时考虑到使用的便利性，单独引入

1550nm(D1550)和1625nm(D1625)的色散系数指标。

G.652.D的新色散指标如表 1 所示。

并按照以下公式画出边界：

从1260 nm到1460 nm：

$$\frac{\lambda S_{0max}}{4}\left[1-\left(\frac{\lambda_{0max}}{\lambda}\right)^4\right] \le D(\lambda) \le \frac{\lambda S_{0min}}{4}\left[1-\left(\frac{\lambda_{0min}}{\lambda}\right)^4\right] \quad (\lambda \le \lambda_{0min}),$$

$$\frac{\lambda S_{0max}}{4}\left[1-\left(\frac{\lambda_{0max}}{\lambda}\right)^4\right] \le D(\lambda) \le \frac{\lambda S_{0max}}{4}\left[1-\left(\frac{\lambda_{0min}}{\lambda}\right)^4\right] \quad (\lambda_{0min} \le \lambda \le \lambda_{0max}),$$

$$\frac{\lambda S_{0min}}{4}\left[1-\left(\frac{\lambda_{0max}}{\lambda}\right)^4\right] \le D(\lambda) \le \frac{\lambda S_{0max}}{4}\left[1-\left(\frac{\lambda_{0min}}{\lambda}\right)^4\right] \quad (\lambda_{0max} \le \lambda)$$

从1460 nm 到 1625 nm：

$$8.625 + 0.052(\lambda - 1460) \le D(\lambda) \le 12.472 + 0.068(\lambda - 1460)$$

d) 7.2节(PMD)中增加了一个备注，“对于PMD系数较高的光纤光缆，可以使用在对PMD要求较低的系统中，例如对于一些短距离的链路或者一些PMD冗余较高的系统”；

e) 表1和表2中，都增加了备注，说明对于比1625nm更长波长处的衰减系数（主要用于监测目的）并不确知，但一般情况下，由于宏弯和微弯的影响，衰减系数随着波长的增加而增大；

f) G.652.D的模场直径由（8.6～9.5）±0.6μm修改为（8.6～9.2）±0.4μm；

g) G.652.D的包层直径容差由1μm修改为0.7μm；

h) G.652.D的衰减系数全部修改为两位小数位，例如1310nm到1625nm范围内的最大衰减系数由0.4dB/km修改为0.40 dB/km；

i) 增加了附录1，为衰减系数、色散、PMD几个参数的统计计算示例；

j) 增加了附录2，记录了在ITU-T进行的针对G.652.D光纤，在本研究期内对各主要光纤光缆厂家在1270nm到1625nm范围内的色散系数进行调查的结果。

2.2 ITU-T Rec.G.657最新版本主要修订内容

本次修订没有新增光纤类别，但扩展了G.657.A类光纤的应用范围，因此对其色散、模场直径的指标进行了缩紧，总体来说修订内容不多。修订后的G.657.A类光纤与G.652.D类光纤相兼容，G.657.A仅有两个指标优于G.652.D，一是宏弯损耗，二是芯包同心度，其它均完全一致。

ITU-T Rec.G.657的2016版相比2012年版主要有以下修订内容：

a) 本次修订了Rec.G.657的标题和范围，删除了G.657.A类光纤“接入网用”的限制，将G.657.A类光纤的应用范围扩展到与G.652.D同等的所有场景。

b) 增加了第五章“约定”，其中说明了修约规则，“数值应先修约到与表格中的指标位数一致，再进行比较。修约采用四舍五入的方法，该方法的描述可以在ISO 80000-1的Annex B，Rule B中找到；

表 1 G.652.D 的新色散指标

色散系数 3 阶 Sellmeier 方程拟合（1260nm ~ 1460nm）	λ_{0min}	1300	nm
	λ_{0max}	1324	nm
	S_{0min}	0.073	ps/(nm^2 × km)
	S_{0max}	0.092	ps/(nm^2 × km)
线性拟合（1460nm ~ 1625nm）	最小值 @1550nm	13.3	ps/(nm × km)
	最大值 @1550nm	18.6	ps/(nm × km)
	最小值 @1625nm	17.2	ps/(nm × km)
	最大值 @1625nm	23.7	ps/(nm × km)

c) 对G.657.A类光纤的色散指标进行了修订，与G.652.D光纤的修订保持一致；

d) G.657.A和G.657.B的模场直径均由（8.6～9.5）±0.4μm修改为（8.6～9.2）±0.4μm；

e) 上一版本的附录1移到了ITU-T G-Sup.59（光纤光缆可靠性导则）中。

2.3 ITU-T Rec.G.654最新版本主要修订内容

本次修订新增了光纤类别G.654.E，主要用于陆地长距离高速100Gbit/s或超100Gbit/s数字相干系统传输，改善光传输信噪比(OSNR)性能。

G.654.E的技术指标如表 2 所示。

与G.652.D一样，G.654中也增加了修约规则的章节，并在附录1说明了统计计算方法，该附录与G.652.D完全一致。

2.4 ITU-T Rec.G.sup.59

ITU-T新发布的增补文件G.sup.59“Optical Fibre and Cable Reliability Guidelines光纤光缆可靠性导则”，主要提供了光纤光缆在长期使用过程中针对可靠性方面的指导，采用的是现阶段被广泛接受的模型以及一些经验，描述了随着时间的推移，可能对光纤光缆可靠性的各方面产生影响的情况。这篇增补文件主要描述的是对光纤光学性能和光纤机械性能的影响，以及光缆的哪些因素将影响到这些性能。

这篇增补文件对加深光纤光缆可靠性方面的认识、对光纤光缆的使用、工程施工均具有积极的意义。

2.5 ITU-T G.650.2

G.650.2在2015年6月会议上提交了审批草案并于2015年8月正式发布。在本次修订中，删除了SOP方法，增加了PMDQ的定义。

2.6 关于进一步修订G.650.1和G.650.3建议

G650.1和G.650.3的修订将在下一研究期继续进行。其中主要的讨论内容如下：

G.650.1的修订中，关于截止波长基准法的定义将在后续会议继续讨论确定；

G.650.3的修订中，日本NTT建议增加使用BOTDA单向测试熔接损耗的方法，ITU-T在2015年6月会议后将日本方面的文稿发给了IEC SC86C征求意见，但根据联络函的反馈，IEC SC86C的专家认为该方法存在一定的问题，该议题将在后期会议中继续讨论。

表 2　ITU-T G.654.E

光纤属性			
特性	详情	值	单位
模场直径	波长	1550	nm
	标称值范围	11.5-12.5	μm
	容差	±0.7	μm
包层直径	标称值	125	μm
	容差	±1	μm
芯同心度误差	最大值	0.8	μm
包层不圆度	最大值	2.0	%
光缆截止波长	最大值	1530	nm
宏弯损耗	半径	30	mm
	圈数	100	
	最大值 @1625nm	0.1	dB
筛选应力	最小值	0.69	GPa
色散系数	$D_{1550max}$	23	ps/(nm · km)
	$D_{1550min}$	17	ps/(nm · km)
	$S_{1550max}$	0.070	ps/(nm^2 · km)
	$S_{1550min}$	0.050	ps/(nm^2 · km)
未成缆光纤 PMD 系数	最大值	（注 2）	
光缆属性			
特性	详情	值	单位
衰减系数（注 1）	最大值 @1550nm	0.23	dB/km
PMD 系数（注 2）	M	20	盘
	Q	0.01	%
	最大值 PMD_Q	0.20	ps/ √ km
注 1：本表中列出的衰减系数值不适用于短段光缆，如跳线。又例如，IEC 60794-2-11 规定室内电缆的衰减系数小于等于 1.0dB/km。			
注 2：表中对未成缆光纤的 PMD_Q 最大值进行规定，以支持光缆 PMD_Q 的主要要求。			

3．ITU-T 下一研究期的主要方向（光纤）

现阶段G.650.1，G.650.3，G.651.1，G.sup.40，G.sup.47均在修订过程中，并将在未来几次会议讨论后发布新版本。

Telefonica、NTT、KDDI在2016年2月会议上曾联合提交文稿建议Q5/15开始讨论关于空分复用（SDM）技术的研究。经会议讨论后，认为基于现有技术发展，现阶段很难起草一个完整的ITU-T建议，但欢迎在未来的会议中继续相关内容的讨论。

2017年6月将是新一轮研究期的第一次会议，很可能会有新的提案提交到ITU-T讨论。

4．结束语

2016年9月的会议是2013～2016研究期的最后一次会议，Q5顺利完成了ITU-T Rec.G.652、G.654、G.657和G.sup.59（G.sup.fcr）这四个建议新版本的审批发布。各方应充分关注这些建议的变化内容并消化吸收，在技术研发、市场推广等方面及时应对。

总体回看2013～2016年研究期G.652和G.657的修订，总体趋势是缩紧加严各项指标，但由于各家利益纷争，常常争执不下，最后妥协达成基本一致。但随着光纤技术的不断发展，更优的产品、更严的指标不可避免的将成为趋势，各家应提前做好技术、质量工作，以应对光纤标准、市场需求的最新变化。

Abstract:

ITU is the United Nations specialized agency for information and communication technologies. ITU-T, the Standardization Sector of ITU, is responsible for developing standards of all telecommunication equipments and systems except wireless communication. The Study Groups of ITU-T assemble experts from around the world to develop international standards known as ITU-T Recommendations which act as defining elements in the global infrastructure of information and communication technologies (ICTs). Standards are critical to the interoperability of ICTs and whether we exchange voice, video or data messages, standards enable global communications by ensuring that countries' ICT networks and devices are speaking the same language.

This paper introduces the standard new progress on optical fibres in ITU-T Study Group 15 up to September 2016, emphasized on revisions of optical fibre standards, new contents and research hotspots.

Standard new progress on optical fibres

☐ Li Jing from R&D Center

1 . Introduction

The international standards (ITU-T Recommendations) produced by Study Group 15 detail technical specifications giving shape to global communication infrastructure. The group's standards define technologies and architectures of optical transport networks enabling long-haul global information exchange; Þbre- or copper-based access networks through which subscribers connect; and home networks connecting in-premises devices and interfacing with the outside world.

ITU-T Study Group 15/Q5 is responsible for setting standards related to characteristics and test methods of optical Þbres and cables.

2 . Standard new progress on optical Þbres

ITU-T SG15/Q5 experts assembled for 6 times during last study period 2013-2016, focused on revisions of G.652, G.654, G.657, G.650.1, G.650.2, G.650.3 and new supplement G.sup.fcr. During the Þnal meeting of last study period in September 2016, SG15/Q5 Þnally Þnished discussions of these recommendations' revision. The updated editions of ITU-T Rec. G.652、G.654、G.657 and new supplement G.sup.59(G.sup.fcr) have been published on website of ITU-T.

2.1 Revisions on ITU-T Rec. G.652

This new edition didn't add new fibre sub-categories, the technical changes are emphasized on G.652.D specifications: chromatic dispersion, mode field diameter, geometry parameters are more strict than last edition. G.652.B speciÞcations are maintained as the same as last edition.

Compared with ITU-T Rec. G.652 2009 edition, the latest 2016 edition has the following technical revisions:

a) Considering G.657.A and G.652.C have been rarely used in current networks, Tables 1 (G.652.A) and Table 3(G.652.C) of last edition have not been changed. These tables are not

included in this version of Recommendation ITU-T G.652, but are in the 2009 edition;

b) New clause 5 "Conventions" has been added. "Values shall be rounded to the number of digits given in the tables of recommended values before conformance is evaluated. The conventional rounding rule of "rounding half away from zero" is used, which is described in Annex B, Rule B of [ISO 80000-1].";

c) In Table 2 (G.652.D) new specification has been introduced for chromatic dispersion. Chromatic dispersion specification for G.652.D fibres has been changed into boundary line speciÞcation at the wavelength range of 1260nm-1625nm.

From 1260 nm to 1460 nm, the three-term Sellmeier Þtting is appropriate.

From 1460 nm to 1625 nm, linear fitting on chromatic dispersion is appropriate.

Maximum and minimum chromatic dispersion parameter at 1550 nm and 1625nm have been speciÞed in table 2.

Chromatic dispersion coefÞcient D(λ) at wavelength λ is bound by the following three inequalities:

From 1260 nm to 1460 nm,

$$\frac{\lambda S_{0\max}}{4}\left[1-\left(\frac{\lambda_{0\max}}{\lambda}\right)^4\right] \le D(\lambda) \le \frac{\lambda S_{0\min}}{4}\left[1-\left(\frac{\lambda_{0\min}}{\lambda}\right)^4\right] \quad (\lambda \le \lambda_{0\min}),$$

F

$$\frac{\lambda S_{0\max}}{4}\left[1-\left(\frac{\lambda_{0\max}}{\lambda}\right)^4\right] \le D(\lambda) \le \frac{\lambda S_{0\max}}{4}\left[1-\left(\frac{\lambda_{0\min}}{\lambda}\right)^4\right] \quad (\lambda_{0\min} \le \lambda \le \lambda_{0\max}),$$

$$\frac{\lambda S_{0\min}}{4}\left[1-\left(\frac{\lambda_{0\max}}{\lambda}\right)^4\right] \le D(\lambda) \le \frac{\lambda S_{0\max}}{4}\left[1-\left(\frac{\lambda_{0\min}}{\lambda}\right)^4\right] \quad (\lambda_{0\max} \le \lambda)$$

rom 1460 nm to 1625 nm,

$$8.625 + 0.052(\lambda - 1460) \le D(\lambda) \le 12.472 + 0.068(\lambda - 1460)$$

d) New note has been added in 7.2(PMD) describe usability of high PMD fibre and cable for system with less stringent PMD requirements;

e) In Table 1 (G.652.B) and Table 2 (G.652.D) Note 1 has been extended with text "Attenuation coefficient at a wavelength longer than 1625 nm (for monitoring purpose) is not well known. In general, the attenuation increases as the wavelength increases, and it may show steep wavelength dependence due to both macro- and microbending losses."

f) The mode field diameter specification of G.652.D has been tightened from (8.6-9.5) ±0.6μm to (8.6-9.2) ±0.4μm ;

g) The cladding diameter tolerance of G.652.D has been tightened from 1μm to 0.7μm ;

h) In Table 2 (G.652.D) the attenuation specifications have been edited to two decimal places. For example, attenuation speciÞcation of 1310nm to 1625 nm range has been change from 0.4 dB/km to 0.40 dB/km ;

i) Added in Appendix I a new clause I.6 "An example of statistical methodology" related to attenuation coefficient, chromatic dispersion and PMD.

j) New Appendix II has been added highlighting the data collection on maximum and minimum chromatic dispersion over wavelength range 1270 nm to 1625 nm for the boundary line speciÞcation of G.652.D Þbres.

2.2 Revisions on ITU-T Rec. G.657

This new edition didn't add new Þbre sub-categories, but extended the application scope of G.657.A fibres. Chromatic dispersion, mode field diameter, geometry parameters are

G.652.D new chromatic dispersion specification:

Chromatic dispersion parameter 3-term Sellmeier fitting (1260nm to 1460 nm)	$\lambda_{0\min}$	1300	nm
	$\lambda_{0\max}$	1324	nm
	$S_{0\min}$	0.073	ps/(nm^2 × km)
	$S_{0\max}$	0.092	ps/(nm^2 × km)
Linear fitting (1460 nm to 1625 nm)	Minimum at 1550 nm	13.3	ps/(nm × km)
	Maximum at 1550 nm	18.6	ps/(nm × km)
	Minimum at 1625 nm	17.2	ps/(nm × km)
	Maximum at 1625 nm	23.7	ps/(nm × km)

tightened than last edition. After revision, G. 657.A and G.652.D are almost compatible except more strict specifications of macrobending and core concentricity parameters of G.657.A

Compared with ITU-T Rec. G.657 2012 edition, the latest 2016 edition has the following technical revisions:

Table 2 ITU-T G.654.E

Fibre attributes			
Attribute	Detail	Value	Unit
Mode Þeld diameter	Wavelength	1550	nm
	Range of nominal values	11.5-12.5	μm
	Tolerance	±0.7	μm
Cladding diameter	Nominal	125	μm
	Tolerance	±1	μm
Core concentricity error	Maximum	0.8	μm
Cladding non-circularity	Maximum	2.0	%
Cable cut-off wavelength	Maximum	1530	nm
Macrobending loss	Radius	30	mm
	Number of turns	100	
	Maximum at 1625 nm	0.1	dB
Proof stress	Minimum	0.69	GPa
Chromatic dispersionparameter (Note 1)	$D_{1550max}$	23	ps/(nm · km)
	$D_{1550min}$	17	ps/(nm · km)
	$S_{1550max}$	0.070	ps/(nm^2 · km)
	$S_{1550min}$	0.050	ps/(nm^2 · km)
Uncabled Þbre PMD coefÞcient	Maximum	(Note 3)	
Cable attributes			
Attribute	Detail	Value	Unit
Attenuation coefÞcient(Note 2)	Maximum at 1550 nm	0.23	dB/km
PMD coefÞcient(Note 3)	M	20	cables
	Q	0.01	%
	Maximum PMD_Q	0.20	ps/ √ km
NOTE 1:From 1530 nm to 1625 nm, chromatic dispersion coefÞcient D(λ) at a given wavelength λ can be speciÞed by the equation (6-1) in clause 6.10.			
NOTE 2:The attenuation coefÞcient values listed in this table should not be applied to short cables such as jumper cables. For example, [b-IEC 60794-2-11] speciÞes the attenuation coefÞcient of indoor cable as 1.0 dB/km or less.			
NOTE 3:According to clause 7.2, a maximum PMDQ value on uncabled Þbre is speciÞed in order to support the primary requirement on cable PMD_Q.			

a) The title and scope have been modified to include the usage of sub-category G.657. A macrobending loss improved Þbres for all applications (access networks as well as general transport networks) where G.652. D Þbres are used.

b) New clause 5 "Conventions" has been added. "Values shall be rounded to the number of digits given in the tables of recommended values before conformance is evaluated. The conventional rounding rule of "rounding half away from zero" is used, which is described in Annex B, Rule B of [ISO 80000-1]." ;

c) New specification has been introduced for chromatic dispersion of G.657.A as the same as G.652.D.

d) The mode field diameter speciÞcation of G.657.A and G.657.B has been tightened from (8.6-9.5) ±0.6μm to (8.6-9.2) ±0.4μm ;

e) Appendix I of last edition has been moved to Appendix I of [ITU-T G-Sup.59]

2.3 Revisions on ITU-T Rec. G.654

This edition includes the addition of new fibre sub-category G.654.E in order to support 100Gbit/s and beyond 100Gbit/s digital coherent transmission system in terrestrial deployments.

New clause 5 "Conventions" has been added.

New clause I.6"An example of statistical methodology" has been added as well.

2.4 ITU-T Rec. G.sup.59

ITU-T new supplement G.sup.59"Optical Fibre and Cable Reliability Guidelines", provides guidance regarding the long term reliability

of cabled optical fibres. This document uses currently accepted models combined with current experience to describe items that can impact the performance of an optical fibre over time. The document describes "optical reliability" for fibres, "mechanical reliability" for fibres and describes how optical cables impact these properties.

This supplement is very helpful for better understanding of optical fibre and cable reliability and the application, engineering constructions of optical fibres and cables.

2.5 ITU-T G.650.2

G.650.2 has been consent in June 2015 and final published in August 2015. In this new edition, SOP method has been deleted, and definition of PMDQ has been clarified.

2.6 Further revision of ITU-T G.650.1 and G.650.3

Revision of G.650.1 and G.650.3 will be continue discussed during the new study period, up to now, related topics are as following:

In revision of G.650.1, RTM of cutoff wavelength measurement will be discussed in future meetings.

In revision of G.650.3, NTT Japan proposed adding new appendix with respect to the test methods for splice loss based on quasi-bidirectional measurement. Outgoing Liaison to IEC SC86C was sent after SG15 June 2015 meeting to request comments for IEC experts. According to the feedback, IEC SC86C WG1 experts do not recommend promotion of this technique because of some technical concerns. This topic is open for discussion in future meetings.

3 . ITU-T Future direction of work (Fibre)

Revised Recommendation G.650.1 , G.650.3 , G.651.1 , G.sup.40 , G.sup.47 are expected to consent at future meetings in this study period.

Telefonica, NTT and KDDI submitted a contribution in February 2016, proposed to start discussion on the space division multiplexing (SDM) technologies. After some discussion, Q5/15 shared that it is difficult to consider a conceptual document at this timing, but welcomes further contribution for future discussion.

In June 2017, the þrst meeting of new study period will be held, other proposals, contributions are expected to be submitted and discussed.

4 . Conclusion

September 2016 meeting was the last meeting during 2013-2016 study period, Q5 successfully þnished the consent of G.652, G.654, G.657 and G.sup.59 (G.sup.fcr). Please pay attentions to these technical changes and adjust as early as possible in technical R&D and market promotions. If review the revisions of G.652 and G.657 in just þnished study period, because of dispute of interests of different parties, it's difþcult to reach agreement for most topics but need to þnd a compromise way as a solution. However, as the þbre technology continuously develop, better products, more strict speciþcations will be an inevitable trend in the future. The relevant companies need to prepare in technique as well as quality in advance, to keep up with standards changes and customer's demands.

万物互联，长飞“智”连

□ 长飞智连公司　姚鹏

如今流传着这样的互联网进化论：PC互联网–移动互联网–物联网，PC互联网带来信息对称，移动互联网带来效率对接，物联网将升级为万物互联。

无论是最初人与人建立通信连接的传统电信网，还是人与人、人与物信息传递的互联网，以及不通过PC为中介的移动互联网，再到眼下正迈入万物互联时代的物联网，上层千变万化的网络应用都以底层通信介质——光纤为基础。光纤互连构建了信息传输、交换、处理、存储等现代通信的主要支柱，光纤技术是世界技术革命的重要标志。

万物互联，“基”不可失

万物互联将实现信息自由共享、价值按需分配。宽带互联网所提供的高带宽和大容量为万物互联提供了基础保障，高宽带来自宽带高速骨干网所给予的宽带通信网络支撑，大容量则依赖于数据中心所提供的高可靠大容量数据处理能力。

中国公用计算机互联网（ChinaNET）是我国九大骨干网之一，与电信基础网络实现互通互联，这些骨干网构成了万物互联的网络基础，而这些网络的基石则是光纤连接。骨干网光纤的关注重点是传输性能，接入网和局域网领域的光纤光缆则要求更加便捷的终端操作、更细化的管理层次，以及更重要的短距离高带宽和大数据可靠计算。骨干网和接入网、局域网不同的使用需求对光纤性能提出了不同的要求，在信息化的过程中，研发者们需要根据不同需求研发出不同性能的光纤。

（一）在骨干网中使用的光纤主要有：

- G.652.D非色散位移单模光纤

被用来构建城域网，在波长1310nm处零色散，波长1550nm处衰减最小，波长1380nm处无氢峰，支持10Gbps系统至少3000km的传输距离，40Gbps系统至少80km的传输距离。

● G.654.E截止波长位移单模光纤

凭借大有效面积、超低损耗特性，为400G网络的规模部署铺路，实现长距离陆地干线或跨洋洲际海底光纤通信。

● G.656宽带非零色散光纤

利用波分复用技术实现高带宽远距离信息传送，比G.652光纤色散系数更小，比G.655光纤工作波长更宽，支持40Gbps系统至少400km的传输距离。

（二）在接入网和局域网中使用的光纤主要有：

● G.657弯曲衰减不敏感单模光纤

用于接入网光纤到户，实现比铜缆双绞线优越的弯曲半径。

● 宽带多模弯曲不敏感光纤

在850nm～950nm波段范围内都具有高带宽，采用短波长波分复用（SWDM）技术，单根光纤可以进行100G传输，可以实现数据中心从10G/40G向25G/100G服务器/骨干速率升级，支持25G/100G系统光纤链路至少300米的传输距离。

（三）传感技术中使用的光纤：

● 多芯光纤和少模光纤

采用空分复用技术，在万物互联传感技术中一方面可以显著提升光纤通信系统的传输容量；另一方面，还可利用多芯光纤和少模光纤同一光纤中共同传输时拥有不同的空间分布特性开展更前沿的传感技术研究。

作为实现万物互联最为重要的“基石”，光纤光缆技术在互联网不断演进、升级的背景下也在加快发展步伐，随着实现万物互联的5G移动无线网络的深入研究以及数据中心的蓬勃发展，光纤光缆产业将迎来新的机遇，而这一产业的发展和技术创新，也将为万物互联的ICT技术加速发展奠定更深厚的基础。

长飞光纤铺路，万物智慧互连

在光纤用于人类通信的短短几十年间，光纤网络已遍布全球，至今光纤已在全球敷设了数亿公里，成为互联网、全球信息通信、万物互联的基础。信息化高速发展的过程也是光纤技术不断进步的过程。长飞公司在专注企业自身发展的同时，始终将推进行业发展作为己任，专注于光纤技术的持续进步。

近年来，长飞公司不仅在全贝G.652.D常规通信光纤方面取得了丰硕的成果，还先后推出了全球领先的远贝®超低衰减大有效面积G.654.E光纤、高保实®宽带非零色散G.656光纤、易贝®弯曲衰减不敏感G.657.A2/B3光纤、超贝®宽带多模BI-OM4光纤等新型产品。2015年3月，长飞在美国OFC大会期间，面向全球正式发布了性能大幅提升的“远贝®超强”超低衰减大有效面积单模光纤，成为国内首家、全球第三家拥有大有效面积超低衰减光纤产品的厂商，也是国内唯一掌握超低衰减光纤技术的企业，填补了国内空白。2015年6月，长飞公司参与应用试验的全球运营商首个新型“大有效面积光纤”（国际电信联盟标准代号为G.654.E）光缆陆地应用工程项目（新疆哈密-巴里坤和山东济南-青岛）顺利通过了中国联通的验收，标志着中国联通在全球电信运营商中首个部署的新型“大有效面积光纤”光缆的试验取得初步成功。长飞公司的全系列产品和解决方案不仅丰富了光纤应用，并且以实际行动带动了中国光纤光缆行业的整体技术进步，也为迎接万物互联时代的到来做好了准备。

随着业界对5G网络的深入探索和信息通信技术的进步，有关专家预测万物互联将在下一个十年基本完成，到2020年，将有500亿台设备通过网络实现互联。更多的设备意味着对数据中心的更多访问量和更高的要求，其中最大的需求莫过于规模的挑战。仅就智能手机而言，每600台手机就需要一个新的服务器以提供服务，这些设备通过网络连接至云、数据中心，正在形成一个加速增长的良性循环，也即将开启万物智能互联的新世界。

无论是基于PON设备的FTTx光分配网络ODN，还是采用开放式体系结构、支持所有通信协议的综合布线，长飞公司iCONEC®高端解决方案为万物互联提供了大数据、云计算、高带宽的全新网络基础链路，顺应了全球特别是中国市场的发展趋势。iCONEC®解决方案其最核心的数据中心超贝®宽带超强抗弯多模光纤，具有850nm～950nm全波段高带宽，采用短波长波分复用(SWDM)技术，可实现单根光纤传输100Gbps数据，为万物互联高速可靠运行拓宽更为广阔的智慧空间。

Internet of Everything, YOFC "Intelligent" Connectivity

☐ Yao Peng from YOFC Connectivity

Now such an internet evolution law is widely spread: PC internet-mobile internet-internet of things, PC internet brings information symmetry, mobile internet brings efficient connection and internet of things brings internet of everything.

Whether the originally traditional telecommunication network for man-to-man communication connection or the internet of man-to-man and man-to-thing information transfer and non-PC-based mobile internet, and even the internet of things that is now stepping into the era of internet of everything, ever changing upper network applications are all based on lower communication medium –optical fiber. Optical fiber interconnection forms the main pillar of information transmission, exchange, handling, storage and other modern communications, and optical fiber technology is an important symbol of the world's technological revolution.

Internet of everything can't do without a "base".

Internet of everything will realize free information sharing and on-demand value distribution. High bandwidth and large capacity provided by broadband internet provides the internet of everything with a basic guarantee, high bandwidth is supported by the broadband communication network offered by broadband high-speed backbone network and large capacity relies on the high-reliability and large-capacity data handling capacity.

ChinaNET is one of the nine backbone networks in China, interconnecting and networking with telecom basic network. Such backbone networks form the network base for the internet of everything and their footstone is optical fiber connection. Backbone network fiber focuses on transmission performance, optical Þber and cable of AN and LAN Þeld require more convenient terminal operation, much finer management level and more important short-distance high-bandwidth and reliable counting of big data. Different use requirements of backbone network, AN and LAN make different demands on optical fiber performance. In the process of informatization, researchers need to research and develop the optical Þbers with different performances according to different requirements.

(I) The optical fibers used in backbone network mainly include:

● G.652.D dispersion-unshifted single-mode Þber

It is used to establish MAN, with zero dispersion at wave length of 1310nm, the minimum attenuation at wave length of 1550nm and zero hydrogen peak at wave length of 1380nm. It can support 10Gbps system with a transmission distance of at least 3000km and 40Gbps system with a transmission distance of at least 80km.

● G.654.E cutoff-wavelength shifted single-mode optical Þber

With large effective area and ultra-low loss, it paves the way for scale deployment of 400G network, so as to realize long-distance land artery or transoceanic intercontinental undersea optical Þber communication.

● G.656 broadband non-zero dispersion optical Þber

It uses wavelength division multiplexing technology to achieve high-bandwidth long-distance information transmission, with a smaller dispersion ratio than G.652 optical fiber, a wider operating wavelength than G.655 optical fiber, and it supports 40Gbps system with transmission distance of at least 400km.

(II) The optical fibers used in AN and LAN mainly include:

● G.657 bending attenuation insensitive single-mode optical Þber

It is used for AN FTTH, to achieve superior bending radius than copper twisted pair.

● Broadband multimode

bending insensitive optical Þber

It can provide high bandwidth in a wave length range of 850nm~950nm and adopts SWDM technology. Single optical Þber can make 100G transmission and realize the upgrading of data center from 10G/40G to 25G/100G, supporting 25G/100G system fiber link with a transmission distance of at least 300m.

(III) The optical fibers used in sensor technology:

● Multi-core optical fiber and few-mode optical Þber

The use of spatial-division multiplexing technology can not only significantly improve the transmission capacity of optical Þber communication system in sensor technology for internet of everything, but also carry out more advanced sensing technology research with different spatial distribution characteristics that multi-core optical fiber and few-mode optical fiber have when they make common transmission in a same Þber.

As the most important "cornerstone" to realize interne of everything, the technology of optical fiber and cable is also developing must faster under the background of internet evolution and upgrade. With the deep research of 5G mobile wireless network of internet of everything and the vigorous development of data center, optical fiber and cable industry will usher in new opportunities, and the development and technological innovation of this industry will also lay a more solid foundation for the accelerated development of ICT technology of internet of everything.

YOFC optical fiber paves a way for intelligent interconnection of everything

In the past few decades of optical fiber application in human communication, optical fiber network has been spread all over the world, and so far, hundreds of millions of kilometers of optical fibers have been laid in the world and become the foundation of internet, global information communication and internet of everything. The rapid development process of information technology is the process of continuous progress of optical fiber technology. YOFC will always take the promotion of industry development as its mission and focus on continued progress in fiber technology while focusing on its own development.

In recent years, YOFC has not only made fruitful results in the Quanbei G.652.D conventional communication optical fiber, but also introduced the world's leading Yuanbei® G.654.E fiber with ultra-low attenuation and large effective area, Gaobaoshi® broadband non-zero dispersion G.656 fiber, Yibei® bending attenuation insensitive G.657. A2 / B3 fiber, Chaobei® broadband multimode BI-OM4 fiber and other new products successively. In March 2015, during the US OFC Conference, YOFC formally launched to the world "Yuanbei® super" single-mode fiber with ultra-low attenuation and large effective area with significantly increased performance, becoming the first domestic and the world's third manufacturer of fiber products with large effective area and ultra-low attenuation and also the only domestic enterprise that masters ultra-low attenuation fiber technology, filling a domestic gap. In June 2015, the first land application project (Hami-Barkol, Sinkiang and Jinan-Qingdao, Shandong) of new "large-effective-area Þber" (ITU code G.654.E) and optical cable by global operators of which YOFC participated in application test successfully passed the acceptance of China Unicom, marking the initial success of the test of the first new "large-effective-area optical Þber" that China Unicom set up in the global telecom operators. Full range of products and solutions of YOFC not only enrich Þber applications, but also promote the overall technological progress of Chinese optical fiber and cable industry with practical action and make a preparation for the arrival of the era of internet of everything.

With the industry's deep exploration of 5G network and advances in information and communication technology, experts predict that internet of everything will be basically completed in the next decade, by 2020, there will be 50 billion devices interconnected through internet. The larger number of devices means more accesses to data center and higher demands, and the biggest demand may be the scale challenge. In the case of smart phones alone, a new server is needed for every 600 handsets to provide services. The devices connect with cloud and data center via the network and are forming a virtuous cycle of accelerated growth, which will open a new world of intelligent interconnection of everything.

Whether FTTx optical distribution network ODN based on PON device, or integrated wiring that uses an open architecture and supports all communication protocols, iCONEC® high-end solution of YOFC provides a brand-new network infrastructure link for big data, cloud computing and high bandwidth, conforming to the market development tendency of the world, especially China. The core data center of iCONEC® solution, Chaobei® broadband super-bending-resistance multimode fiber, has a high bandwidth in the full wave length range of 850nm~950nm, and with SWDM technology, it can realize the 100Gbps data transmission over a single fiber, broadening a wider intelligent space for high-speed and reliable operation of the internet of everything.

长飞公司成功举办第八届运动会暨第三届趣味运动会

□ 制造中心 张流

为丰富员工业余生活，促进各部门员工之间的交流，2016年11月5日，长飞公司工会、团委、战略中心共同举办了第八届运动会暨第三届趣味运动会。

由公司各中心和事业部组建的8支队伍共计240名选手参加了本届运动会。运动会包括多人拔河、智勇闯关、步步高升等九大项目，组委会还特意安排了拔河投篮、空中定格、红心大战、奋进小鸟等四个互动项目，让员工和家属们能够共同感受长飞大家庭的温馨与欢乐。

比赛最有看点的是智勇闯关项目，该项目由一个近100米长的巨型充气赛道组成，中间穿插了攀岩、滑道等一系列障碍模块，参赛队员都直呼跑得过瘾，挑战了极限。值得一提的是，抢占高台项目的参赛人员全部都是公司的女员工，在开心比赛过程中，她们不仅展示了奋勇拼搏不服输的竞技精神，同时也增进了彼此间的友谊，在场观众都不禁为她们爆发出“女汉子”的一面而加油鼓掌。

最终光纤二队获得了冠军，亚军和季军分别为研发中心队和光缆一队。一年一度的运动会是新朋老友齐聚的盛会，长飞人比智慧、较耐力、拼团队协作，发扬的是拼搏精神，增进的是相互间的友谊。随着运动会的结束，大家纷纷一起合影留念，期待来年的再次相会。

The 8th sports meeting and 3rd fun sports meeting of YOFC

☐ Zhang Liu from Manufacturing Center

In order to enrich the leisure time of staff and promote their communication, the 8th sports meeting and 3rd fun sports meeting were held on November 5,2016,by trade union, league committee and strategic center of YOFC.

8 teams with 240 attendees made of different centers and business departments of YOFC participate in this sports meeting. The sports meeting consists of 9 events including tug of war, "Just Go" and "up up go". The organizing committee also arranges 4 interactive events, namely, tug of war shooting, fixation on the sky, red heart fight and fighting bird so that employees and their families can feel and warmth and happiness of YOFC.

"Just Go" is the most attractive event. On a huge gas-filled track nearly 100 meters, there are a series of blocks including rock mountain and slide. All the participants say it is challenging and exciting. It is noteworthy that all the participants Þghting for high-level are female. They not only display their competitive sportsmanship but also increase their mutual friendship. All the audiences acclaim for their courage.

Finally, optical fiber 2nd team wins the champion. The second and third prizes are R&D center team and optical cable 1st team respectively. The annual sports meeting is a social event for friends to gather. YOFC employees show their sportsmanship, wisdom, patience, teamworking and friendship. With the end of the sports meeting, people take pictures as a memory to expect another event next year.

超越速度，享受激情

——长飞公司第二届卡丁车大奖赛圆满召开

☐ 制造中心 王杰

由工会、团委和战略中心共同举办的长飞公司第二届卡丁车大奖赛于11月27日圆满结束，来自公司各中心共100多名车手斗志昂扬地参加了这场速度与激情的盛宴。

赛场上，加油声此起彼伏，这里仿佛变成F1赛车的赛场。随着比赛的开始，各位车手陆续出发，直线加速、减速过弯、漂移过弯、发夹弯道漂移、甩尾超车……他们都在全力展现自己的车技，向着冠军冲刺，为部门赢得荣誉。

经过初赛和复赛的激烈角逐，四名选手挺进决赛。选手和观众都怀着紧张、期待的心情，期盼着车王争霸赛的上演。随着指挥令旗的挥动，轰鸣声中，四辆赛车如离弦之箭飞奔而去。最终，制造中心光缆部徐锦夺得冠军，特种产品事业部刘志恒获得亚军，制造中心光纤部赵文琪获得季军。

本届卡丁车大赛充分展现出长飞人拼搏进取、积极乐观的精神面貌。长飞人工作时勤奋努力、兢兢业业；工作之余，生龙活虎、活力四射，长飞人时刻散发着奋勇向前的正能量，必将推动长飞公司业绩蒸蒸日上。

Enjoying the pleasure of high speed

The 2nd Karting Competition of YOFC

☐ Wang Jie from Manufacturing Center

The 2nd Karting Competition of YOFC jointly held by trade union, league committee and strategic center drew a successful conclusion on November 27. Over 100 kart racers from various centers in the company attended the competition in high spirits.

With the cheer-up voice, it is like the circuit of F1. When the competition starts, different kart racers show their different skills including straight speeding-up, reducing the speed to pass a chicane, over-corner drift, over-hairpin drift and overtaking to fight for the champion and win the reputation for their own department.

After the Þerce competition of early round and semiÞnal race, 4 racers are in the Þnal round. Both racers and audience expect the final round both nervously and excitedly. When the ßag waves, four karts run like the arrow. Finally, Xu Jin of the optical cable department of manufacturing center wins the champion. Liu Zhiheng of the special product department wins the second prize. And Zhao Wenqi of the optical fiber department of manufacturing center wins the third prize.

The karting competition reflects fully the diligent, positive and optimistic attitude of YOFC employees. In work, YOFC employees are diligent. After work, they are active and energetic. With full energy, YOFC employees will definitely promote the business of the company.

长飞潜江公司新员工培训圆满结营

□ 长飞潜江公司 余宇哲

为了帮助新员工调整工作心态、提升职业素养，真正从思想上、作风上实现成为合格长飞人的转变，2016年9月20日～11月4日，长飞潜江公司的125名新员工参加了为期46天的军训、安全教育、光纤制造理论和生产管理等方面的培训。

本次军训以及培训目标明确，活动的任何步骤和环节都围绕目标展开，突出了主题，确保了活动的明显成效。其中军训的目的定位在两点：一是锻炼身体与收心，强化公司员工的纪律性和高效的执行力；二是培养公司员工自信心、责任心与文化认同感，通过“学习、生活交流会”，了解员工需求，改进个人行为，提升员工沟通能力、培养团队协作精神、增强团队凝聚力与向心力。本次培训的目标在于提高员工的安全意识，养成遵守规则的习惯，通过理论学习了解光纤制造流程，植入先进的管理理念，提高员工的综合素质。在培训过程中，不论是刚毕业的青年员工，还是年龄偏大的维修师傅，他们都以积极乐观的姿态参与其中，在严格的军事化训练中克服困难、坚守阵地，认真仔细完成每一个训练项目、每个环节的任务，没有一个人无故缺席。“强健体魄、挥洒激情、磨砺青春、明德尚行”的口号响彻云霄，全体新员工的精神面貌也焕然一新，整个培训活动取得了圆满成功。

训练期间还开展了一系列演讲与竞赛活动，“如何做一名优秀员工”的演讲，让新员工了解到了优秀员工必备的素质，为他们正式上岗提供了标准；通过观看“大国工匠”，开展结合光纤制造的“工匠精神”演讲，大家认识到了平凡岗位的坚持、踏实的不易，对待工作要有一丝不苟、一以贯之的态度。

公司员工郭富强提到“我们要做心中的工匠，成为别人眼中的工匠”；李昭提出“我们要‘敬’业，对工作要有敬畏之心，要有把每天的工作当做第一次去做’的理念”。细微中追求极致，正是光纤制造过程中所需要的工匠精神，这种精神也将成为推动员工今后拼搏奋斗的精神动力。

另外，我们的员工多才多艺，在不到一天的准备时间内，自编自导自演了一场有声有色、丰富多彩的生日PARTY，吹拉弹跳、萨克斯、魔术、四地方言三句半等节目表演让现场掌声不断。在工会委员竞选、团委竞选中，大家慷慨激昂，竞争激烈，纷纷亮出自己做好工会、团委活动的绝招。这些活动充分彰显了我们员工的才干，体现了严谨与活泼的和谐。

长飞潜江公司项目即将进入工艺调试阶段，相信经过严格训练的员工，在各自的工作岗位上将以踏实、拼搏、进取的精神面貌，以“以客户为中心，做有责任心的长飞人”来要求自己，充分发挥个人的潜能，推动潜江项目的顺利投产。

New Staff Training of YOFC (Qianjiang) Came to a Successful Close

☐ Yu Yuzhe from YOFC (Qianjiang)

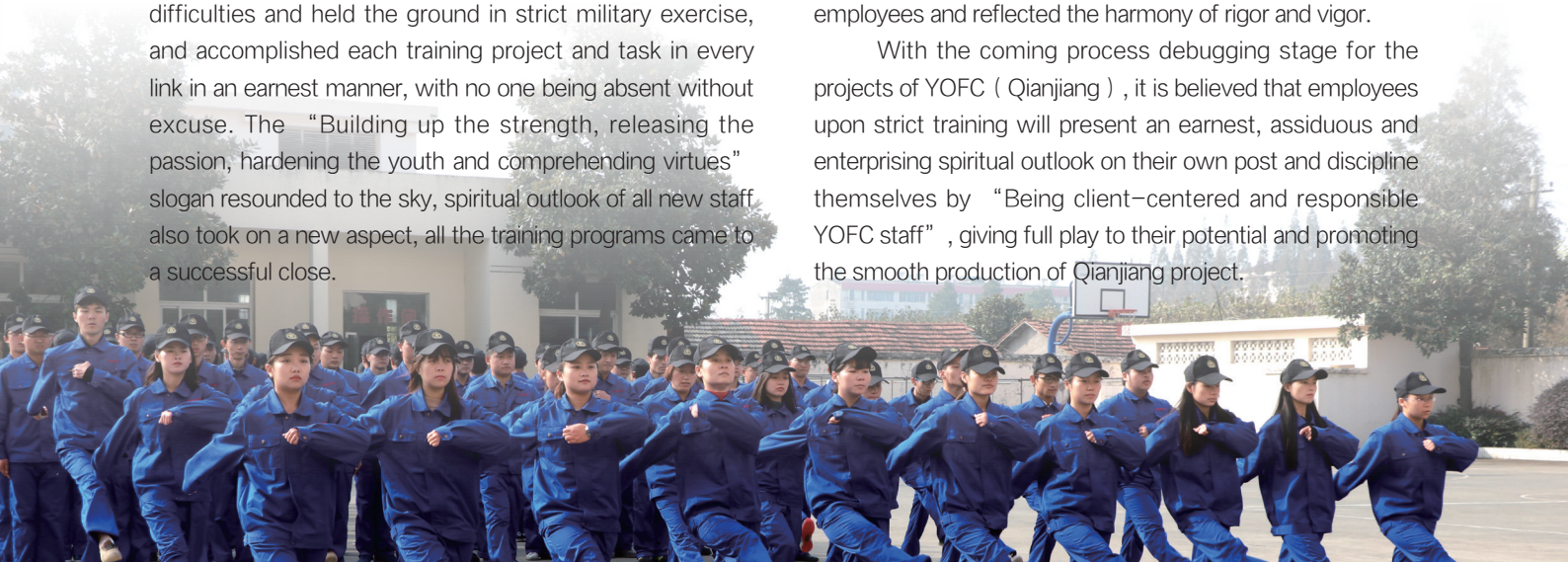
To help new staff adjust their work attitude, improve their professional quality and truly transform them into qualified YOFC staff in both ideology and manner, 125 new employees from YOFC (Qianjiang) participated in the training programs lasting for 46 days with regard to military exercise, security education, optical fiber manufacturing theory, and production & management, etc. in the period from Sept. 20 to Nov. 4, 2016.

The military exercise and training intended to achieve clear objectives. All procedures and activities were carried out for the objectives, highlighting their themes and guaranteeing remarkable results. The objectives of military exercise involved two points: (1) make physical exercise and get into the frame of mind for work, and improve employees' sense of discipline and efficient executive ability; (2) cultivate their confidence, sense of responsibility and cultural identity, by means of "Exchange meeting for study & life", understand their demands, improve personal behaviors and promote their communication skills, cultivate teamwork spirit and enhance team cohesiveness and centripetal force. The training aimed to raise staff's consciousness for safety, develop their habits of abiding by rules, learn optical fiber manufacturing process through theoretical study, introduce advanced administration ideas and enhance their overall quality. During orientation, either young employees fresh out of college or maintenance masters with older age took an active part therein, overcame difficulties and held the ground in strict military exercise, and accomplished each training project and task in every link in an earnest manner, with no one being absent without excuse. The "Building up the strength, releasing the passion, hardening the youth and comprehending virtues" slogan resounded to the sky, spiritual outlook of all new staff also took on a new aspect, all the training programs came to a successful close.

During training, a series of speeches and contests were carried out. For example, the speech "How to be an outstanding employee" furnished new employees the qualities required for outstanding ones, providing them standards for formal service; the watch of "Great Country Craftsman" in combination with the speech of "Craftsman spirit" in optical fiber manufacturing made us realize the difficulty of being persistent and earnest on ordinary posts as well as the attitude of being scrupulous about every detail and being consistent towards work. Employee Guo Fuqiang mentioned that "We should be craftsman in our own heart and craftsman in others' eyes". Li Zhao put forward that we should respect the job, do it as the first try. Pursuing excellence in particulars is the craftsman spirit required in optical fiber manufacturing process, which also becomes the spiritual motivation driving employees to fight for victory and triumph in the future.

Besides, our versatile employees prepared and performed an impressive and colorful birthday party within the time of less than a day, playing instruments, dancing, saxophone, magic show, saying dialect as well as other programs and performances were greeted with a storm of applause on site. In the campaigns for the member of the trade union committee and of CYL committee, employees were filled with energy, keen in competition and playing their ace in accomplishing trade union and CYL committee activities. These activities fully demonstrated talents of our employees and reflected the harmony of rigor and vigor.

With the coming process debugging stage for the projects of YOFC (Qianjiang), it is believed that employees upon strict training will present an earnest, assiduous and enterprising spiritual outlook on their own post and discipline themselves by "Being client-centered and responsible YOFC staff", giving full play to their potential and promoting the smooth production of Qianjiang project.



长飞沈阳公司举行首届篮球赛

□ 长飞沈阳公司　何小琼

为了丰富广大员工的文体娱乐生活，充分发挥员工们的团队协作精神，增加员工之间的企业凝聚力和自豪感，2016年10月23日，长飞沈阳公司组织举办了首届篮球赛活动。

虽然是一场小型的篮球赛，但各部门积极响应，纷纷组队参加比赛。经过6场积分赛的激烈角逐，生产部一队与生产部二队在总决赛狭路相逢，于当日下午展开了冠军争夺战。

运动员们在场下亲密无间，在球场上却是你争我赶，不放过任何一个得分的机会。场外拉拉队热情高涨，欢呼声、呐喊声让篮球比赛气氛不断升温，后勤工作人员则积极做好后勤保障工作。经过20分钟的艰苦鏖战，生产部二队凭借良好的团队配合和战术运用，以32:16的大比分优势战胜了生产一队，夺得本次篮球赛的冠军。生产一队取得了第二名，设备部一队取得了第三名，质保部一队取得了第四名。

长飞沈阳公司首届篮球赛圆满成功，经过这次篮球赛，公司同事间的关系更加融洽，合作意识有了显著提高，长飞沈阳公司也进一步提升了团队建设的水平。

The 1st basketball competition of YOFC (Shenyang)

□ He Xiaoqiong from YOFC (Shenyang)

In order to enrich the entertainment of staff, give full play to their teamworking and increase their loyalty and pride in the company, YOFC (Shenyang) organized the 1st basketball competition on October 23,2016.

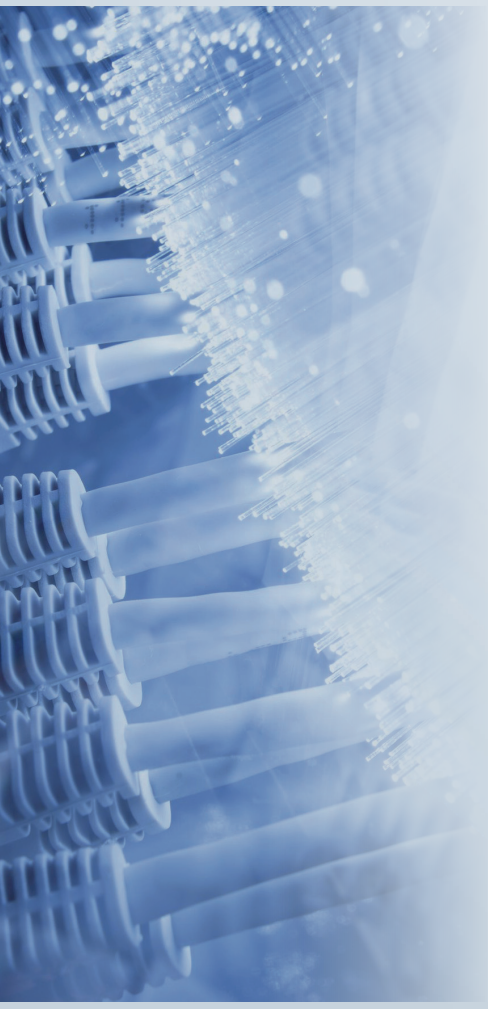
Although it is a small basketball competition, departments respond proactively and make up teams. Through the fierce competition of 6 rounds, in the final round, the 1st production team and 2nd production team meet and compete in the afternoon.

By contrast to their friendship in work, they fight fiercely in the competition and grasp every opportunity to get the score. The cheering groups add to the lively atmosphere with their high spirits, shouts, and acclamation. The logistical staff do their work well. Through 20 minutes' fierce competition, the 2nd production team defeats the 1st production team by 32:16 with their good teamworking and good use of strategies and thus becomes the champion of the basketball competition. The 1st production team wins the second prize. The 1st device team wins the third prize and the 1st quality security team wins the fourth prize.

Through this successful basketball competition of YOFC (Shenyang) , the relationship of colleagues will become closer with increasing awareness of cooperation and growing level of the company in teamworking.

科技园，我的维修好兄弟

□ 制造中心 杨汉彪



昨天还是一片荒芜的土地，
今天就屹立起有一座现代化厂房，
长飞科技园就此诞生。
我们高兴，
我们欢喜，
科技园，我的维修好兄弟。

厂房刚建立，房屋既封顶，
为了早投产，必须早日定。
刺骨寒风掠过铁皮围墙，
你们身穿棉袄，进入场地，
铁骨铮铮的男儿无所畏惧，
科技园，我的维修好兄弟。

本部设备迁至科技园，
从拆卸、起运、卸货至安装调试，
进口设备搬迁还原实属不易。
你们群策群力，克服困难想办法，
青春如此潇潇洒洒，
科技园，我的维修好兄弟。

你们拿起榔头、起子和扳手，
校准及固定，精益求精无挑剔，
从着色、二套、成缆及护套线，
一排排崭新设备安装到调试，
速度之快无人比，
科技园，我的维修好兄弟。

公司年头搬迁先扩产，
又接着完成二期、三期和四期，
你们迎晨曦来送晚霞，汗水如雨浸透衣，
青春无怨无悔，
你们见证了光缆产能翻倍，
科技园，我的维修好兄弟。

“一带一路”指引方向，
各地厂房拔地而起，
维修人员冲锋打头阵，
奔赴四方施展设备安装调试手艺，
兄弟工厂传来祝贺，
科技园，我的维修好兄弟。

当一盘盘光缆运出科技园，
当一盘盘光缆运往世界各地，
当公司效益蒸蒸日上，
当香港长飞股市传来好消息，
你们仰望天空，欣喜无比，
科技园，我的维修好兄弟。

春夏秋冬，斗转星移，
你们一路出发，一路凯旋，
奋进的号角永不停息，
我们为你歌唱，
为你点赞，
科技园，我的维修好兄弟。

Salute to the Maintenance Workers in Science Park, My Good Brothers

□ Yang Hanbiao from Manufacturing Center

Yesterday, it was a waste land,
but today, a modern plant emerges here,
marking the birth of YOFC Science Park.
We are happy;
We are proud.
We are good brothers in the family of Science Park.

The buildings were completed immediately after the plant was established.
In order to put it into production earlier, we must finish the construction earlier.
Despite the piercing cold wind sweeping over the iron sheet walls,
You, clad in cotton-padded jacket, entered the field.
You are intrepid iron men.
You are my good brothers in the Science Park.

The Headquarters' equipments were moved to the Science Park.
From dismantling, transportation, unloading to installation and commissioning,
it was really hard to move the imported equipments.
With collective wisdom and efforts, you overcame all difficulties,
demonstrating such natural and unrestrained youthful vigour.
I am proud of you, my good brothers in Science Park.

Holding hammer, screwdriver and wrench in hand,
you calibrated and fixed the equipments perfectly.
From tinting, secondary coating, cabling and sheathed cords
to installation and commissioning of brand-new equipments in rows,
the speed is incomparably fast.
Thanks to you, my dear brothers.
The company expanded production after resettlement in the beginning of year,
and then completed the second, third and fourth phases of the project.
From sunrise to sunset, you worked hard, bathed in perspiration.
Youth never regret.
You witnessed the doubled and redoubled increase in optical cable production capacity.
You are great, my good brothers.

Following the "Belt and Road" Initiative,
plants were built in various places.
The maintenance workers charged forward
to install and debug the equipments here and there.
Congratulations came from our brotherly plants.
Thanks to you, my good brothers.

When coils of optical cables are transported out of the Science Park
to every corner of the world,
when the corporate profit is growing steadily
and when good news of YOFC come from the Hong Kong Stock Exchange,
we are delighted, looking up to the sky.
My good brothers, I am proud of you.

With the change of the seasons,
you set out once and again, and every time, return triumphantly.
The advancing horn is blown incessantly.
I sing for you
and support you,
my dear brothers in Science Park.

手机扫描二维码

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