AOP

ELECTRO OSMOSIS WATERPROOFING SYSTEM

智　能　防　渗　防　潮　系　统

CNTRITON 特莱顿

TRITON NORWAY
RESEARCH AND DEVELOPMENT
挪威特莱顿研发中心

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WATERPROOFING

TECHNOLOGY INNOVATOR

特莱顿 CNTRITON

特莱顿始于1987年，其持有的电渗透脉冲技术国际发明专利，有效解决了地下工程防渗防潮的世界难题，已被证明是国际上处理混凝土结构渗漏潮湿的先进解决方案。

特莱顿全球研发中心位于挪威的萨普斯堡，包括“智慧芯”控制单元在内的所有电子元器件和软件编程均在挪威开发生产与制造。在34年的不断升级发展中，产品被广泛应用于全球，目前业务范围已涵盖军事设施、水利水电、市政交通、地铁隧道、豪宅别墅等领域数十万个高品质地下空间。

特莱顿中国公司引进挪威新一代智能防渗防潮系统，致力将先进的技术和系统方案服务于中国用户，全力推进电渗透防水行业在中国的发展。

随着全国业务的飞速拓展，公司已先后建成特莱顿（福州）营运中心、特莱顿（上海）营运中心，相继进入华北、华东、华中、华南等市场，凭借雄厚的研发实力、高品质的产品和实力团队，公司在中国的本土化战略向前大步推进。以专业技能为依托，在智能防渗防潮系统设计和项目施工方面提供标准化解决方案，用实际行动推动国内建筑防水行业的更新换代，成就行业领军品牌。

TRITON was founded in 1987, and its international invention patent of electroosmosis pulse technology has effectively solved the world problem of impermeable and moisture-proof in underground engineering, and has been proved to be the international advanced solution for the treatment of leakage and moisture in concrete structures.

TRITON's global R&D center is located in Sarpsborg Norway. All electronic components and software programming, including the Intelligent Core control unit, are developed and manufactured in Norway. In 34 years of continuous upgrading and development, our products have been widely used in the world. At present, our business has covered hundreds of thousands of high-quality underground Spaces in military facilities, water conservancy and hydropower, municipal transportation, subway tunnels, luxury villas and other fields.

CNTRITON has introduced a new generation of intelligent impermeable and moisture-proof system from Norway, and is committed to providing advanced technology and system solutions to chinese users, so as to promote the development of the electroosmosis waterproofing industry in China.

With the rapid expansion of the national business, the company has successively built, CNTRITON (fuzhou) operations center, CNTRITON (Shanghai) trading center, one after another into the markets such as north China, east China, central China, south China, with strong research and development strength, high-quality products and the strength team, company's localization strategy in China forward big step forward. Based on professional skills, it provides standardized solutions in the design and construction of intelligent impermeable and moisture-proof system, promotes the upgrading of domestic building waterproof industry with practical actions, and achieves the leading brand in the industry.

目前地下工程面临的问题

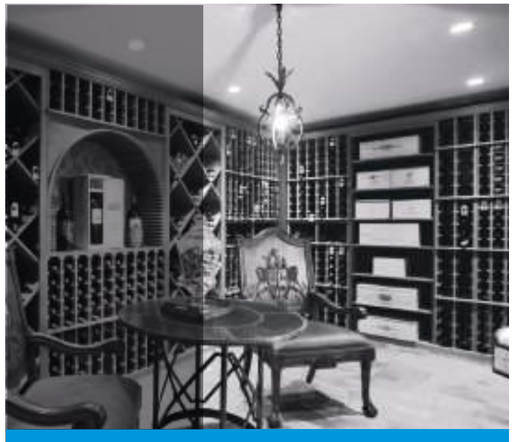
Current Problems Faced by Underground Engineering

今天，私密性和功能性俱佳的地下空间，让业主们青睐有加。然而，地下结构渗漏水，潮湿的顽疾，也带来了一系列的问题：

- 加速混凝土的老化和钢筋腐蚀膨胀，产生恶性循环。
- 增加结构开裂和渗漏水的风险，增加维护成本，缩短结构的使用寿命。
- 破坏地下结构体表面装饰层，造成脱落和发霉。
- 增加地下工程内部空气的相对湿度，恶化空气质量，危害设备和贵重物品。

The attracting expanded space is in the good graces of villa owners. However, the following problems would be incurred by water leakage and humidity:

- Accelerated aging of concrete and erosion or dilation of rebar, leading to a vicious circle.
- Increase the risk of structural cracking and leakage, increase maintenance costs and shorten the service life of the structure.
- Damage to surface decoration layer of underground structure, leading to peeling and mildew growth.
- Lower air quality and damage to equipment or precious articles by increasing relative humidity of air within underground engineering.



问题/渗漏水 Leakage

问题/结露 Condensation

问题/霉变 Mildew

AOP的技术介绍
Introduction of AOP Technology

1930

瑞士的E Fanke发现了通过在正负电极间施加电荷，在含有毛细管的结构内水分子定向流动的原理。

Swiss E Fanke found that directional flow of water molecule within the structure containing capillary could be achieved by applying charges on between the positive and negative electrodes.

REUSS
German Professor

德国Reuss教授发现了结构内毛细孔液体的流动现象和原理。

The German professor Reuss discovered the phenomenon and principle of flowing liquid within the pores of structure.

1807

E Fanke经过试验论证后，正式确定电渗透理论。

E Fanke formally proposed the electric osmosis theory after verified by tests.

1962

1987

挪威发明家 Kjell Utklev 根据这个原理，进行了创新，发明了应用地下工程防渗除湿的第一代电渗透技术EPS（或EOP）（Electric Osmotic Pulse Syestem）并申请了该技术的国际专利，而后创办的挪威特莱顿公司在建筑领域崭露头角，并席卷了欧美市场。在二十多年的实践过程中，该技术也在不断的发展升级，日臻成熟。 已被证明是国际上解决混凝土结构渗漏潮湿的先进解决方案。

According to the principle, Norwegian inventor Kjell Utklev innovated and invented the first generation of electric Osmotic pulse system (EOP) for seepage prevention and dehumidification of underground works, and also applied for associated international patents. Later, a building company was established by him to progressively obtain large shares of European and US markets. After being put into practice for over 20 years, such technology has been upgraded and matured continuously, It has been proved to be an advanced solution to solve leakage and moisture of concrete structure in the world.

Kjell Utklev
挪威特莱顿创始人

在第一代电渗透系统EOP、第二代MPS (Multipe Pulse Sequencing)的基础上，挪威特莱顿研发出了新的第三代系统——AOP (Advanced Osmotis Pulse)。

Based on the first generation of electro osmosis (EOP) and the second generation of MPS (multipe pulse sequencing), Triton Norway has developed a new third generation system, AOP (advanced Osmotis pulse).

2013

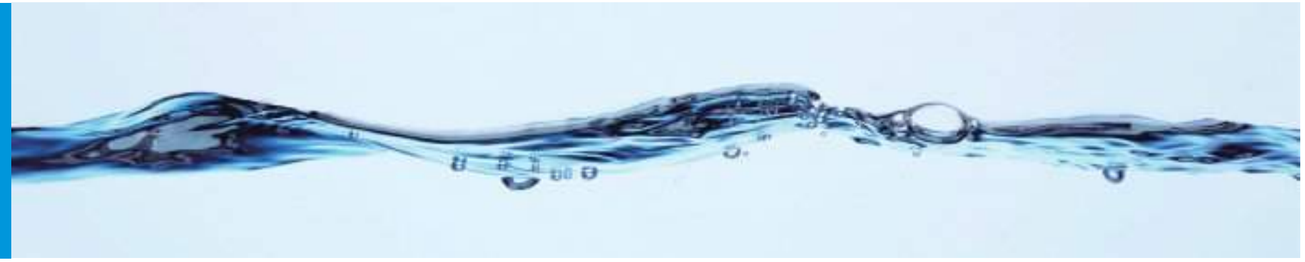
今天
TODAY

挪威特莱顿的中国运营中心位于上海，特莱顿致力于将先进的技术服务于中国用户，目前已经在华东、华南、华北、华中等多个地区落地服务体系，已经成功地运用在国内各地地下工程，解决了防渗防潮的难题，赢得了客户的高度认可。

CNTRITON,the Chinese operations center is located in Shanghai and committed to the advanced technology services to the Chinese users, is now in east China, south China, north China, central China, and many other areas the ground service system, has been successfully applied in underground projects across the country, solved the difficult problem of anti-seepage moistureproof, won the customer's highly recognized.

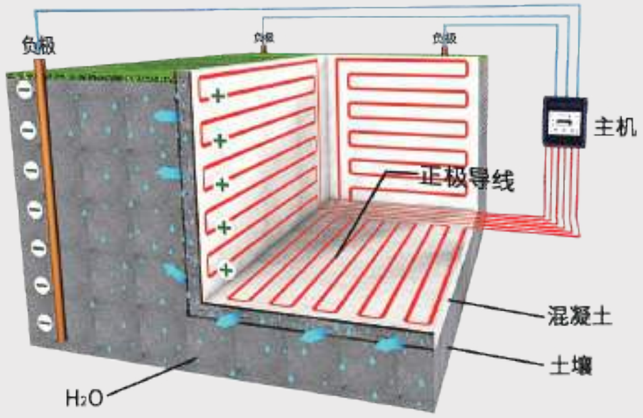
Henning syversen
挪威特莱顿现任技术总监

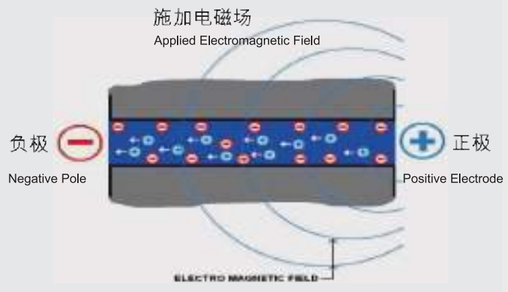
AOP的工作原理
AOP Operating Principle



Based on the electro-osmosis principles, the Advanced Osmotic Pulse (AOP) technology pushes the water molecules within pores or cracks to the lateral structure (i.e. upstream of the negative direction) by a series of low-voltage pulse charges, of which positive charges will move toward negative charges under the influence of low-voltage electromagnetic field. At the same time, such technology can also prevent the outside water from entering the inner side and ensure resistance against invasion of water pressure over 600 m within the operating project (such as leakage stoppage for shaft and turbine chamber of Norway Tonstad hydraulic power plant). Only if the system remains operating, the water molecules will continue to move toward the negative direction, resulting in **Long term dried** condition of the inner side of structure and efficiently reducing air humidity within the structure.

AOP电渗透脉冲技术（Advanced Osmotic Pulse），是根据水的电渗透原理(Electro-Osmosis)，采用一系列低压脉冲电荷，将混凝土或砖墙内毛细管里的水分子电离化，然后将电离化的的水分子通过结构内的毛细孔主动引流到结构外侧去（即迎水面负极方向）。同时，防止外侧的水进入内侧，在实际案例中成功抵抗了600米以上水压的侵入（挪威的Tonstad水力发电厂竖井和水轮机室堵漏处理），只要系统保持工作状态，水分子就一直朝向负极方向移动，致使结构内侧长久保持干燥状态，同时能够有效地降低结构内部空气的湿度。

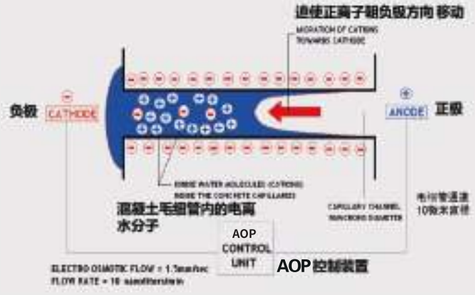




1

在结构的两侧施加脉冲电荷，
即在结构内侧表面安装正极，
负极安装在结构的外侧的水或土壤中，
形成电磁场，
将结构毛细孔中的水分子电离。

Apply pulse charges on both sides of the structure, that is, install the positive electrodes on the inner surface of structure. The negative electrodes should be installed in water or soil outside the structure to form an electromagnetic field, ionizing water molecules of pores.



2

电离后的水分子，
被正电荷推动并朝着负电极方向移动，
从而使结构实现稳定的干燥状态

The ionized water molecules will be pushed by positive charges toward the negative charges, thus achieving stable and dried conditions for the structure.

AOP的系统组成
AOP System Components

① **AOP电渗透控制装置和接线箱**
AOP Electro-osmotic Control Devices and Junction Boxes

② **正极系统由钛金属线安装在结构内侧**
The positive electrode system is arranged on the inner side of the structure by a titanium wire

③ **负极系统为铜棒安装在结构外侧**
Negative Electrode System Mounted on External Structure by Copper Rods

AOP的主要优点
Major Advantages of AOP

效果持久
LASTING EFFECT

有效解决防渗防潮问题,并能够保持结构长期的干燥状态。

It can effectively solve the problem of anti-seepage and dampproof, and keep the structure dry for a long time.

防止结构钢筋腐蚀
PREVENT CORROSION

系统可防止结构中的钢筋腐蚀或锈蚀，同时减少由此引起砼开裂的风险，防止砼结构的风化和老化，延长使用寿命。

The system may prevent corrosion or rust off structure steel and reduce risk of concrete cracking, thus avoiding weathering and aging of concrete structure so as to prolong its service life.

权威认证健康防护
AUTHORIZED HEALTH PROTECTION

采用24V安全电压及低辐射设计，通过欧洲及中国电磁安全检测，让结构和人身更安全。

Adopt 24V safe voltage and low radiation design, pass Europe and China electromagnetic safety test, make the structure and person safer.

抗高压水渗透
ANTI-PENETRATION OF HIGH-PRESSURE WATER

能够抵抗高压水的渗入。

Resist the infiltration of high-pressure water.

智能调节
INTELLIGENT REGULATION

系统会随着结构外侧水位的变化及结构的潮湿程度相应调整电流且保持稳定的脉冲频率，保持稳定的干燥效果。

The system will adjust the current level and keep the stability of pulse frequency along with changes of the water level of external structure and humidity of the structure.

省电节能
ENERGY SAVING

AOP系统采用常规220伏交流电，输出超低电压直流电，运行成本最低，如300-1200平方米的防水面积，耗电量约为0.2-2度/天。

AOP system applies conventional 220 V AC to output ULV DC, ensuring the lowest level of operating costs. For example, a 300-1,200 m² water-proofing area will consume about 0.2-2 degrees/day.

安装方便
EASY INSTALLATION

系统安装灵活方便，可直接在地下室和廊道结构内侧安装，无需额外处理。

The system can be conveniently installed in the basement or inner wall of corridor, requiring no additional processing.

综合造价低
LOWER COMPREHENSIVE COST

AOP控制装置可运行年限为20-30年左右，系统综合造价低。

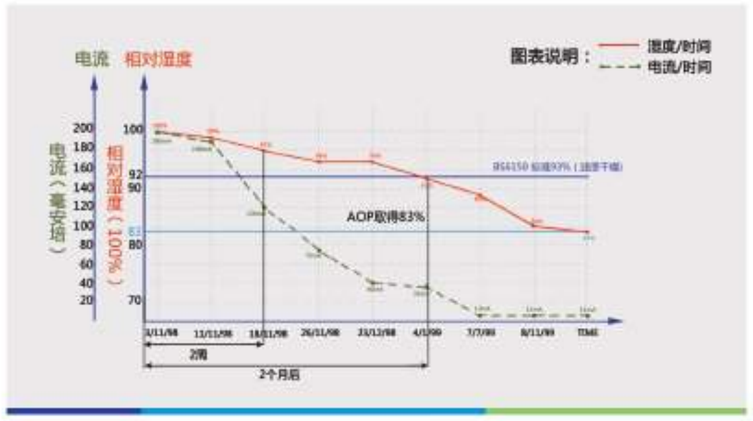
AOP control device can run for about 20-30 years at a rather low level of comprehensive cost.

技术成熟
MATURE TECHNOLOGY

已有30多年的工程成功使用的经验，“一次投入，长久受益”。

More than 30 years of successful use of the project experience, "one investment, long-term benefits.".

AOP系统电流与结构相对湿度变化图
Changes of Current and Structure Relative Humidity in AOP System



AOP电渗透脉冲系统开机运行后，电流由于结构相对湿度的降低呈下降趋势，当结构逐渐实现干燥，电流耗能微乎其微。在系统实际运行中，每年耗电费用极低。

AOP的技术参数
Technical parameters of AOP

规格型号	AOP0300-XS-A	AOP0500-S-A	AOP1000-M-A	AOP1500-L-A
电源	220V (交流电)50Hz			
输出功率 (W)	8-198	8-240	8-500	8-800
使用面积 (m^2)	300	500	1000	1500
输出电压 (V)	<24			
磁场强度 (μT)	≤1.49			
脉冲频率 (s/Hz)	1-4			
排湿时间 (月)	1-3			
排湿强度 (RH)	65-85%			
尺寸 (高/宽/深) MM	270/230/120		320/290/105	
重 量 (KG)	1.8		2.3	
产品安全类别	1级 (永久连接的设备)			
最大室内环境温度 (°C)	60			
外壳防护标准	IP60 (不受灰尘和水的影响)			

WATERPROOFING

TECHNOLOGY INNOVATOR

AOP的权威认证
AOP Authorized Certification

TRITON Norway

产品合格证
Quality Certificate

挪威原产地证明
Certificate of Norwegian Origin

capcis NCEI 国家电子信息产品质量监督检验中心

CAPCIS公司出具的杂散电流测试报告
Stray current test report issued by CAPCIS company

AOP电渗透系统所产生的杂散电流不会对混凝土结构及钢筋产生不良影响
The stray current generated by the AOP electro osmosis system will not have adverse effects on the concrete structure and reinforcement

国家电子信息产品质量监督检验中心出具的电磁强度检验报告
National Electronic Information Product Quality Supervision and Inspection Center Issue electromagnetic strength inspection report

系统经检测满足国家电磁辐射安全限度要求
The system has been tested to meet the national electromagnetic radiation safety limit requirements

York EMC Services Ltd

英国约克大学-电磁波兼容性
University of York – Electromagnetic Compatibility

AOP电渗透系统满足欧洲EMC电磁波兼容性强制标准:89/336/EEC第四款的保护要求!“（既不会对人体、电信、通信、广播及控制信号等系统产生不良影响）”

The AOP control unit is in conformance with the EMC Directive 89/336/EEC. The EMC Directive 89/336/EEC applies to all electrical and electronic equipment and systems.

挪威特莱顿授权书
TRITONNORWAY Authorization

电渗透防渗防潮装置（AOP）外观设计专利证书
Design patent certificate of AOP

电渗透主动防水系统实用新型专利证书
Patent certificate of electric osmosis active Waterproof System utility model

美国专利证书 1994
American Patent Certificate 1994

美国专利证书2000
American Patent Certificate 2000

香港专利证书 1998
HK Patent Certificate 1998

AOP的安装流程
AOP Installation Process

① 表面开槽 安装正极钛金属线
Surface Slotting and Installation of Positive Titanium Wire

安装工程师需勘查地下室所在地的地质结构、水文条件以及建筑物的结构情况，来进行AOP电渗透防渗防潮除湿工程安装设计。在施工现场再根据图纸进行正极线槽的切割，槽的尺寸标准为2cmX1cm.。然后将正极线安装在槽内，应注意避开后期施工造成破坏的情况和如遇到结构内的钢筋应作出相应的处理。

The installation locations for AOP anti-seepage and dehumidification system is designed by our engineers in accordance with geological structures, hydrological conditions and building architecture. The positive trunking (standard size: 2 cm x 1 cm) should be cut on site as per construction drawings. Then the positive wires will be installed within the trunking, while avoiding fracture of late construction and ensuring proper treatment in case of rebar in the structure.

② 用专用砂浆将正极线覆盖
Positive Wire Covered by Mortar

做完第一道工序后紧接着进行第二道，即AOP电渗透防渗防潮除湿工程的正极线填埋作业。该项工序应注意不能随意拿普通的水泥进行填埋，应拿加入一定比例的专用石墨等材料制成具有一定作用的导电砂浆，对正极线进行填埋。（这儿要让所有的水泥填满线槽并压实，内部不能存在缝隙）。

Followed by the first process, the second process should be carried out immediately, i.e. landfill operation of positive wires for AOP anti-seepage and dehumidification system. Note that normal concrete cannot be used for landfill and the positive wires should be buried by the conductive mortar made by graphite and other materials proportionally. Note: such wires should be filled and compacted by cement to avoid any gap within them.

③ 安装负极
Installation of Negative Electrode

AOP电渗透防渗防潮除湿系统负极系统的安装，在低于地下室结构外侧的位置安装负极系统，并用水泥填实，此处开口缝隙要注意填埋，防止有缝隙出现。

As directed by locations designated by professional engineers, the negative system of AOP electro-osmosis system should be installed below the external side of basement structure and compacted by concrete to avoid gaps by totally burying openings and cracks.

④ 安装控制箱和接线箱
Installation of Control Box and Junction Box

将正极系统和负极系统用控制线迁入AOP电渗透防渗防潮除湿系统的控制箱内，标好每条线的位置及作用。

Move the positive electrode into the control box of AOP electro-osmosis system along with the negative system, while marking each and every wire for its location and function.

⑤ 调试系统
Commissioning System

开机试运行，根据系统运行的数据来判断机器运行情况。

During trial run of the system, determine the operation condition of machine according to preliminary readings.

Electro-Osmosis Technology

AOP系统运行效果

AOP System Operation Effect

系统安装前

运行两周后

使用三年的地下室发霉重装

系统安装前

运行两周后

国家电网隧道

系统安装前

系统安装后

系统安装前

系统安装后

应用场景及工程案例
Application Scenarios and Case Studies

特莱顿与三盛百督府
CNTRITON and Sansheng Baidufu Property

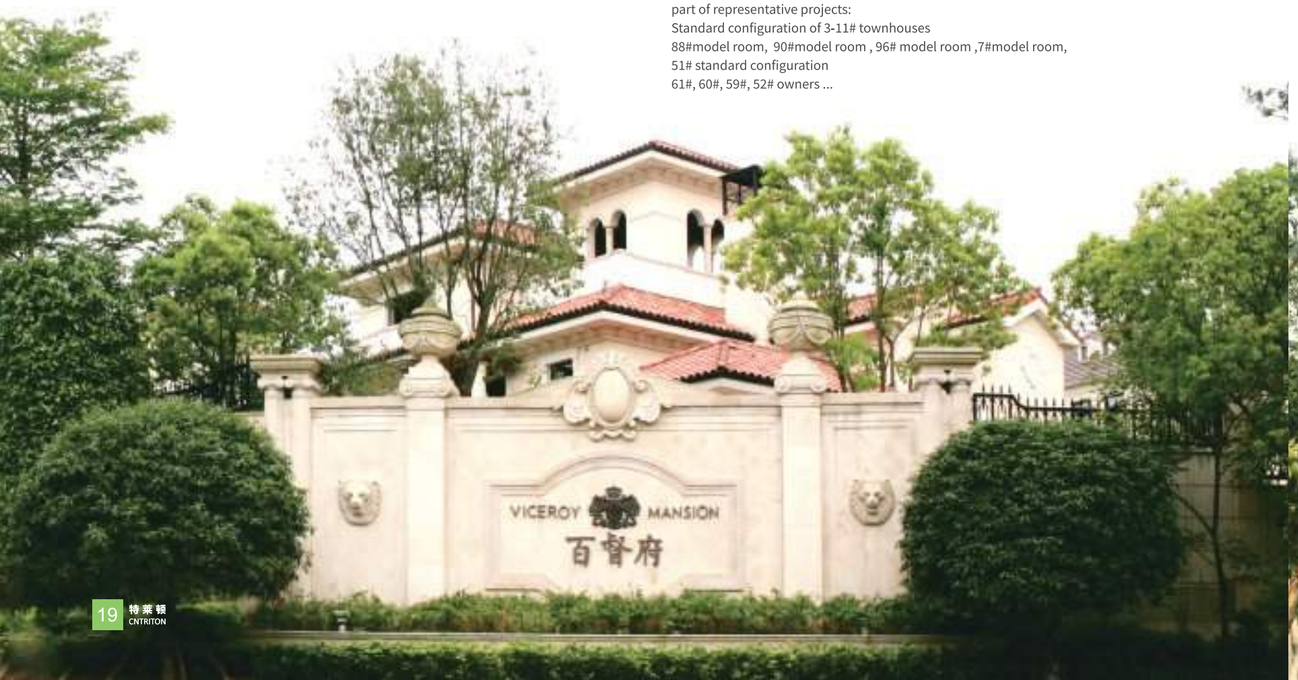
三盛地产作为福建地产的龙头企业，百督府是其开发的具有显著代表性的高端别墅项目。2013年三盛高管团队考察了特莱顿在香港、上海的诸多项目，其对于AOP系统稳定的运行效果充分认可，决定将特莱顿的AOP电渗透系统作为百督府地下室工程的标准配置，为业主们提供当今先进的技术与服务。

Sansheng real estate, as the leading enterprise of Fujian real estate, is one of its representative high-end villa projects. In 2013, Sansheng senior management team inspected many projects of Triton in Hong Kong and Shanghai, and fully recognized the stable operation effect of AOP system, and decided to take the AOP electro osmosis system of Triton as the standard configuration of baidufu basement project, so as to provide the owners with today's advanced technology and services.

部分代表项目：

3-11#联排别墅标准配置
88#样板房，90#样板房，7#样板房，51#样板房标准配置
61#，60#，59#，52#……

part of representative projects:
Standard configuration of 3-11# townhouses
88#model room, 90#model room , 96# model room ,7#model room, 51# standard configuration
61#, 60#, 59#, 52# owners ...



南京证大九间堂
地下室AOP防渗系统安装工程

Nanjing Zhengda jiujiantang
AOP Electro Osmosis System Installation Project in Basement

亚洲十大超级豪宅——南京证大九间堂，由证大集团开发，位于江宁三山中央别墅区，以现代手法及空间需求，运用传统元素、现代材质等重新创造亚洲大宅氛围，写意自然山水，独领东方品位，是厚重内敛的东方文化大宅的典型。

Asia's top ten super luxury -- nanjing zendai nine don, developed by zendai group, three central mountain villa is located in jiangning, and space requirements, with modern technique with traditional elements and modern material to create atmosphere of Asia mansion, freehand brushwork in traditional Chinese natural landscape, the leading Oriental taste, is a representative of the collect inside a thick Oriental culture mansion.

北京· 恒大丽宫别墅
智能防渗防潮系统安装工程

Beijing · Evergrande palace Villa
Installation of intelligent impervious and moisture-proof system

江西· 雍锦王府
智能防渗防潮系统安装工程

Jiangxi · Yongjin Palace
Installation of intelligent impervious and moisture-proof system

上海 · 绿城玫瑰园
智能防渗防潮系统安装工程

Shanghai · Green City Rose Garden
Installation of intelligent impervious and moisture-proof system

杭州· 绿城云栖玫瑰园
智能防渗防潮系统安装工程

Hangzhou · Yunqi rose garden in green city
Installation of intelligent impervious and moisture-proof system

深圳· 观澜观湖苑
智能防渗防潮系统安装工程

Shenzhen · Guanlan Guanhu Garden
Installation of intelligent impervious and moisture-proof system

泉州· 宝珊花园
智能防渗防潮系统安装工程

Quanzhou · Baoshan Garden
Installation of intelligent impervious and moisture-proof system

部分代表项目：
H2#, 27#, 1#.....
Part of representative projects：
H2#, 27#, 1#etc.

烟台· 绿城诚园
智能防渗防潮系统安装工程

Yantai · Green City Park
Installation of intelligent impervious and moisture-proof system

郑州· 国投玖栋
智能防渗防潮系统安装工程

Zhengzhou · Nine buildings of SDIC
Installation of intelligent impervious and moisture-proof system

长沙· 青竹园
智能防渗防潮系统安装工程

Changsha · Green bamboo garden
Installation of intelligent impervious and moisture-proof system

济南· 海尔绿城玺园
智能防渗防潮系统安装工程

Jinan · Seal garden of Haier green city
Installation of intelligent impervious and moisture-proof system

武汉 · 华侨城
智能防渗防潮系统安装工程

Wuhan · Overseas Chinese town
Installation of intelligent impervious and moisture-proof system

青岛· 海信君汇
智能防渗防潮系统安装工程

Qingdao · Hisense Junhui
Installation of intelligent impervious and moisture-proof system

国家电网 — 福州市区地下综合管廊隧道
智能防渗防潮系统安装工程

State Grid - Underground utility tunnel in Fuzhou City
Installation engineering of intelligent anti seepage and moisture proof system

该隧道承担了福州市区三分之二的生产，生活用电。
由于隧道位于地下10米，常年受潮，影响了隧道内设备的正常运行。
AOP电渗透技术以科技项目在国家电网成功报批，并落地安装运行。

The tunnel took up 2/3 of the production of Fuzhou City, the use of electricity.As the tunnel is located 10 meters underground, perennial damp, affecting the normal operation of the tunnel equipment.AOP electro osmosis technology in science and technology projects in the national grid successfully submitted for approval, and landing installation and operation.

WATERPROOFING
TECHNOLOGY
INNOVATOR

应用场景及工程案例
Application Scenarios and Case Studies

隧道工程
TUNNEL PROJECT

香港国际金融中心
智能防渗防潮系统安装工程
Hong Kong International Finance Centre (IFC)
Installation engineering of intelligent anti seepage and moisture proof system

广州地铁6号线
智能防渗防潮系统安装工程
Guangzhou Metro Line No.6
Installation engineering of intelligent anti seepage and moisture proof system

云南西双版纳-藤蔑山高速公路隧道
智能防渗防潮系统安装工程
Expressway Tunnel of Tengmie Mountain in Xishuangbanna, Yunnan Installation engineering of intelligent anti seepage and moisture proof system

应用场景及工程案例
Application Scenarios and Case Studies

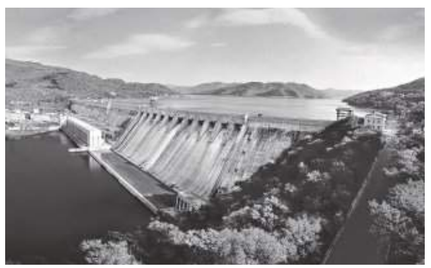
管廊工程
UTILITY TUNNEL ENGINEERING

大连市东区改造项目-地下网管综合管廊
智能防渗防潮系统安装工程
Reconstruction Project of East Area in Dalian Comprehensive Pipe
Installation engineering of intelligent anti seepage and moisture proof system

海洋、海岸地下及水下结构工程
OCEAN, COAST UNDERGROUND AND UNDERWATER STRUCTURES ENGINEERING

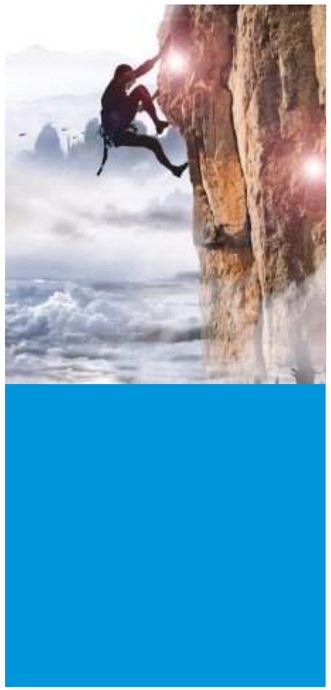
挪威 Sira Kvina水力发电站
智能防渗防潮系统安装工程
Norway Sira Kvina hydropower station
Installation engineering of intelligent anti seepage and moisture proof system

水利水电工程
HYDRAULIC AND HYDROPOWER ENGINEERING



光照水电站大坝-永久观测房
智能防渗防潮系统安装工程
Guangzhao Hydropower Station Dam–Permanent Observation Room
Installation engineering of intelligent anti seepage and moisture proof system

特莱顿核心价值观



我们为了谁
以客户为中心，倾听客户需求，为客户创造价值是我们存在的唯一理由！

谁是特莱顿的主人
以奋斗者为本，依靠努力奋斗的员工，让有贡献者得到合理回报。

我们的合作主张
主张开放，合作、共赢，与客户、伙伴合作创新，扩大产业价值，形成健康良性的产业生态商系统。