安特蓝德公司
点 亮 水 技 术

UV Water Treatment
Atlantium Hydro-Optic™ Solutions

Food & Beverage Industry

安特蓝德公司– 紫外线水消毒技术

安特蓝德公司在饮料的世界

US EPA 验证证书

HDR | HydroQual

April 11, 2011

Subject: Adenovirus Validation of the Atlantium Technologies Ltd. RZ-104 Hydro Optic Disinfection System

To whom it may concern:

This is to certify that Adenovirus validation testing has been satisfactorily completed for the Atlantium RZ104 Hydro Optic Disinfection System in compliance with the USEPA Ultraviolet Disinfection Guidance Manual (UVDGM, November 2006). The test plan for this validation was written by HydroQual Environmental Engineers and Scientists, P.C., Dr. Karl Linden of the University of Colorado at Boulder, Dr. Chuck Gerba and Dr. Akrum Tamimi of the University of Arizona and approved for implementation by Atlantium Technologies.

HydroQual Environmental Engineers and Scientists, P.C. (now known as HDR | HydroQual) supervised all testing, sampling and analysis, data analysis and documentation, and prepared the final validation report, which compiles the results of the validation tests and presents the validated adenovirus disinfection performance summary for the subject system. The calculation of the validation factor for credited RED and virus log inactivation is in conformance with the UVDGM.

Note that the Adenovirus validation tests were part of a larger program in which HDR | HydroQual successfully validated the RZ-104 by MS2, QB and T1 coliphage biodosimetry, in compliance with the UVDGM across a RED range between 20 and 161 mJ/cm^2. These tests defined a broad operating envelope and the resulting RED algorithm was used in making the Adenovirus credited log-inactivation calculations. To reach a credited AD2 log inactivation of 4.0, an MS2 RED_{calc} of 118.3 mJ/cm^2 is required. Similarly, 2- and 3-log inactivations require an MS2 RED_{calc} of 51.9 and 80.0 mJ/cm^2, respectively.

Testing defined the validated operating envelope for achieving LT2 and GWR 4-log virus disinfection credits for the RZ-104 Hydro Optic Disinfection system to power levels between 40 and 100%, flows less than 248 gpm, and UVT greater than 85.3%. The MS2 RED_{calc} should be limited to levels greater than 23.5 mJ/cm^2.

These results demonstrate that the RZ104 UV reactor can accomplish 4-log virus inactivation as required by the UVDGM dose requirements in Table 1-4, making this unit a feasible and acceptable technology choice for Groundwater and LT2 Rule compliance.

Very truly yours,
HDR | HYDROQUAL

O. Karl Scheible

OKS/njh
WordProcessing\Jobs\ATLM.003-153272\Validation11Apr11Ltr
cc: Phyllis Posy, Atlantium

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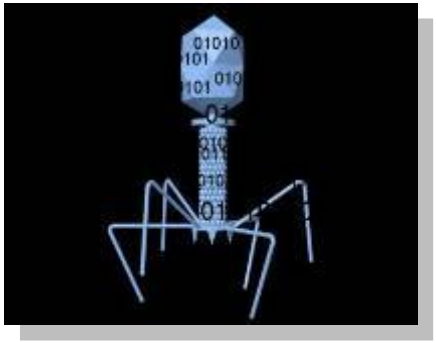
US EPA 验证证书-消除病毒

- 对病毒的验证解决方案
- 现能实现4个数量级的腺病毒杀毒
- 中压汞灯比低压汞灯更有效
- 所需剂量更小

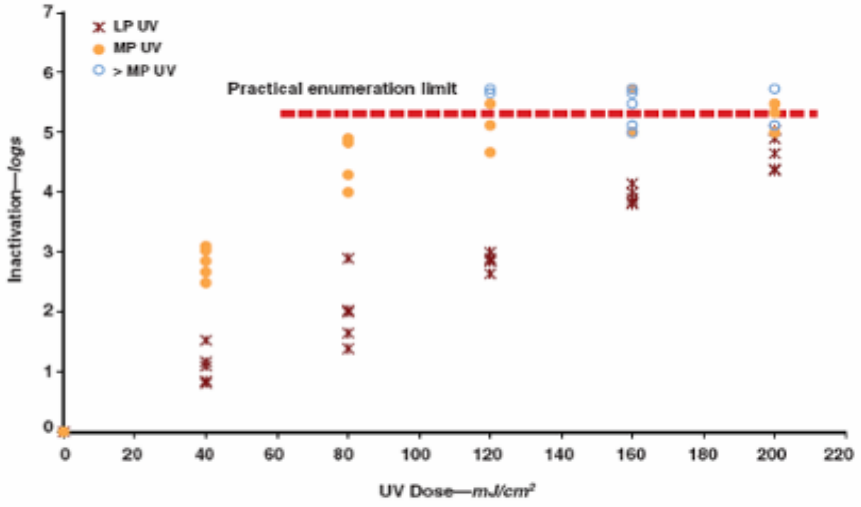


RNA viruses
核糖核酸病毒

ABOUT THE AUTHORS

Karl G. Linden (to whom correspondence should be addressed) is a professor and Liebman Faculty Fellow in the Department of Civil, Environmental, and Architectural Engineering at the University of Colorado, UCB 428, Boulder, CO 80309; karl.linden@colorado.edu. He has a BS degree from Cornell University in Ithaca, N.Y., and MS and PhD degrees from the University of California at Davis. His 15 years of research have focused on the efficacy of alternative technologies in water treatment and water reuse including ultraviolet irradiation for inactivation of microbial pathogens and the use of advanced oxidation for the degradation of envi-

FIGURE 2 Bench-scale data generated for inactivation of the test organism Ad2 under both LP and MP UV lamps



Ad2—adenovirus serotype 2, DNA—deoxyribonucleic acid, LP—low pressure, MP—medium pressure, UV—ultraviolet

Open symbols indicate data points for which complete inactivation occurred. MP UV doses were germicidal as weighted by the DNA absorbance spectrum.

巴氏消毒等量水

Grade "A"

Pasteurized

Milk

Ordinance

(Includes provisions from the Grade "A" Condensed and Dry Milk Products and Condensed and Dry Whey--Supplement I to the Grade "A" PMO)

2009 Revision

U.S. Department of Health and Human Services

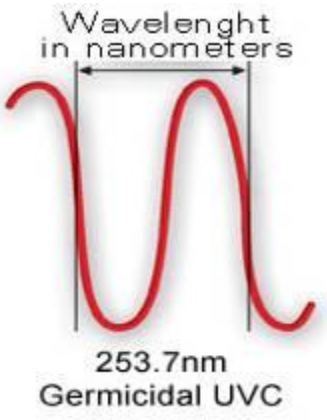
Public Health Service

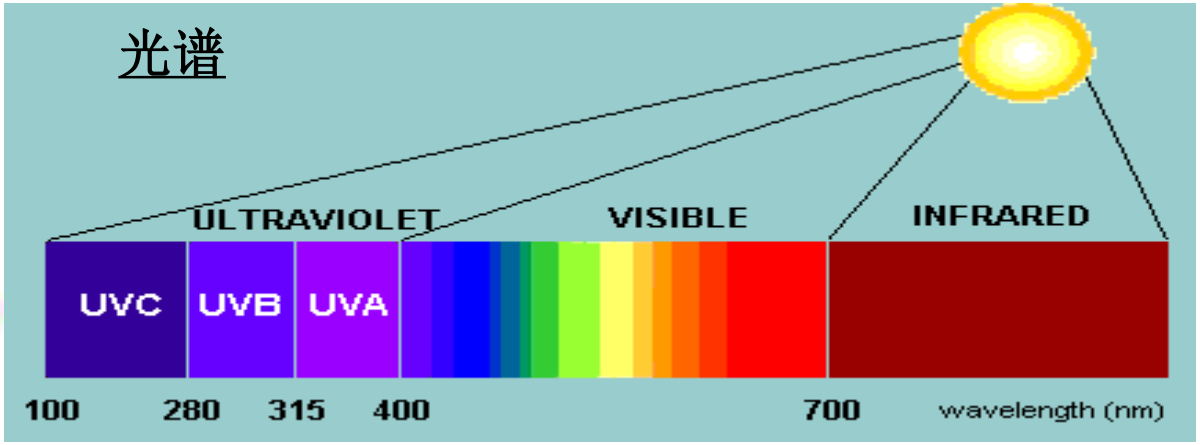
Food and Drug Administration

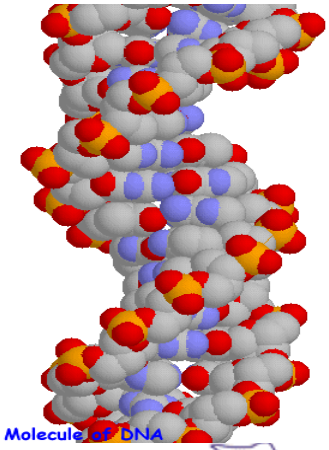
"Atlantium已发表其用于水消毒的水光消毒 ™紫外线巴氏杀菌及消毒系统 。.... Atlantium的 产品发表是在美国食品和药物管理局（FDA）于2009年完成《美国巴氏消毒奶条例》（PMO）并下发了IMS-a-47文件之后。 新条例对在奶制品加工过程中使用紫外线对等量水进行杀菌和巴氏消毒进行了规范。 **Atlantium的系统是唯一的经核准符合PMO全部规范要求的现成紫外线设备。**

紫外线技术

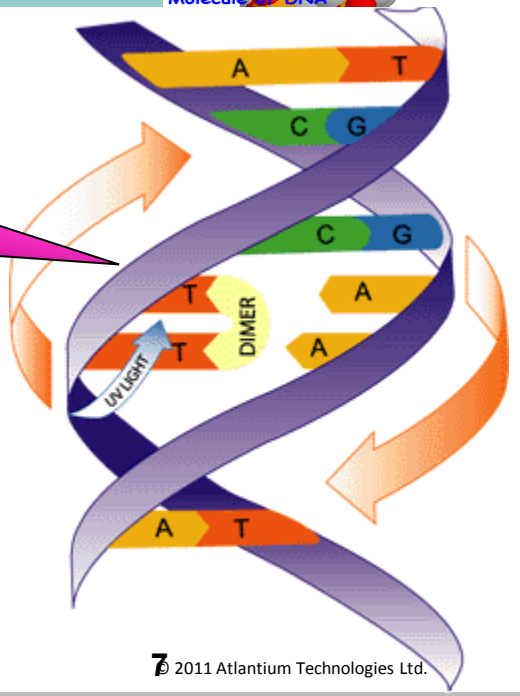
紫外线消毒





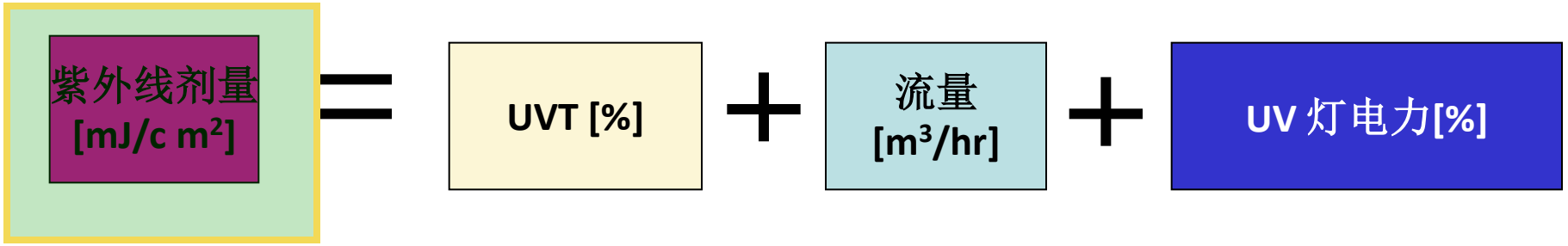


Penetrate cell membrane穿透细胞膜



- 紫外线被脱氧核糖核酸（DNA）和核糖核酸（RNA）吸收
- 紫外光线通过破坏细胞的DNA使其失活
- 形成胸腺嘧啶二聚体
- 抑制 DNA 复制

紫外线剂量



安特蓝德公司HOD 系统

RZ -104-11

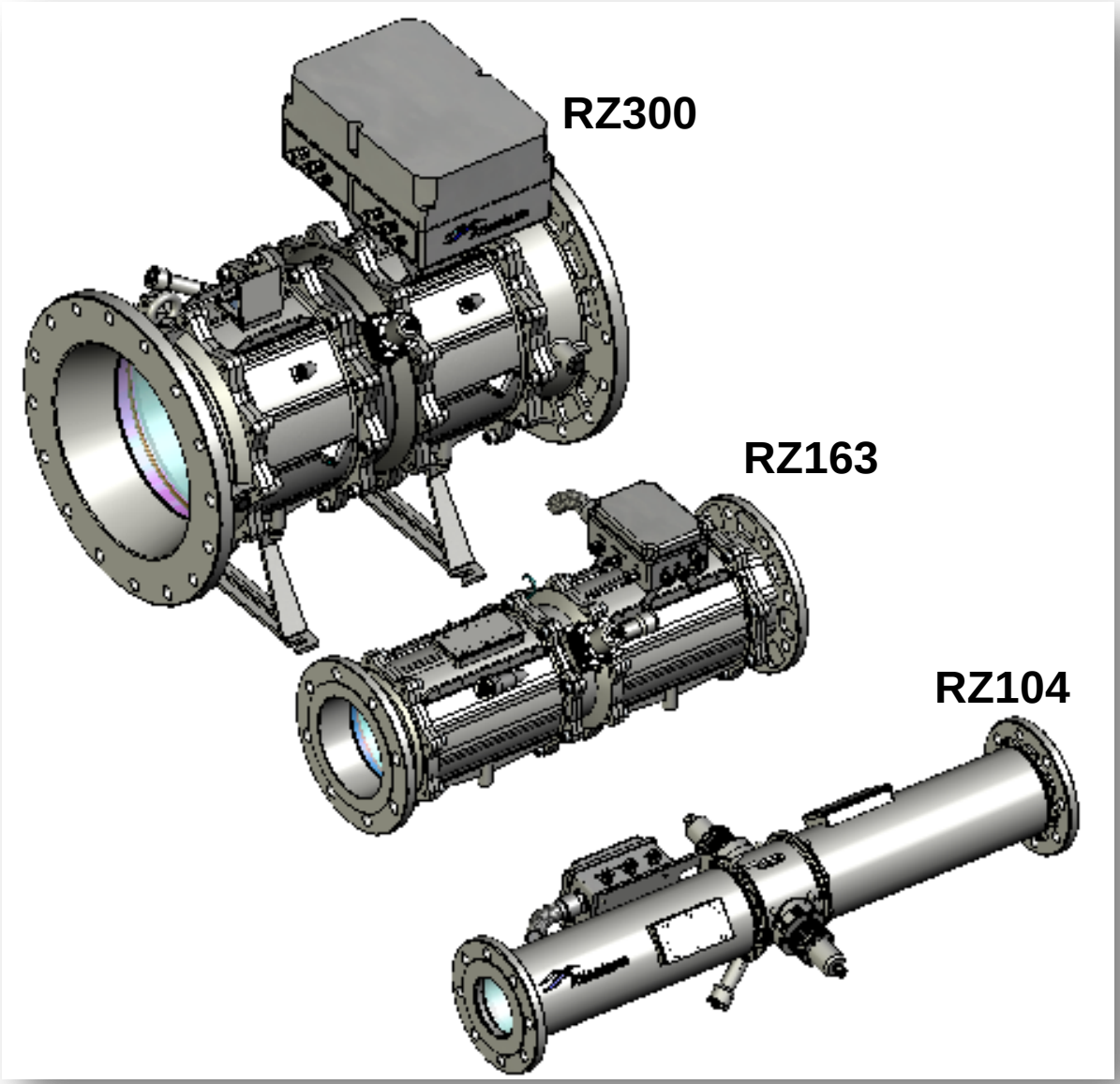
Connection box
接线箱

Viewing port
观察孔

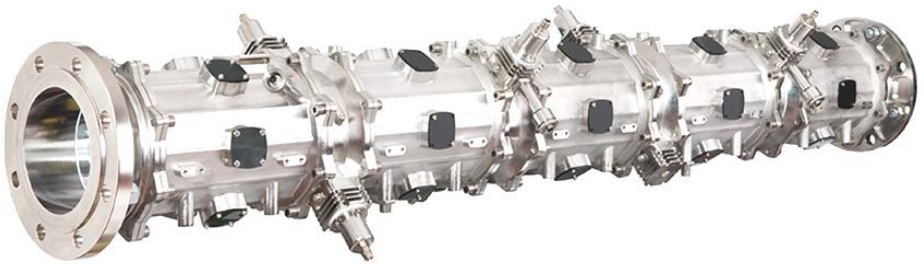
LSM - 紫外灯效率直测

WTM-内置水透射率监测器

RZ HOD 产品模型系列



RZ HOD 产品模型系列



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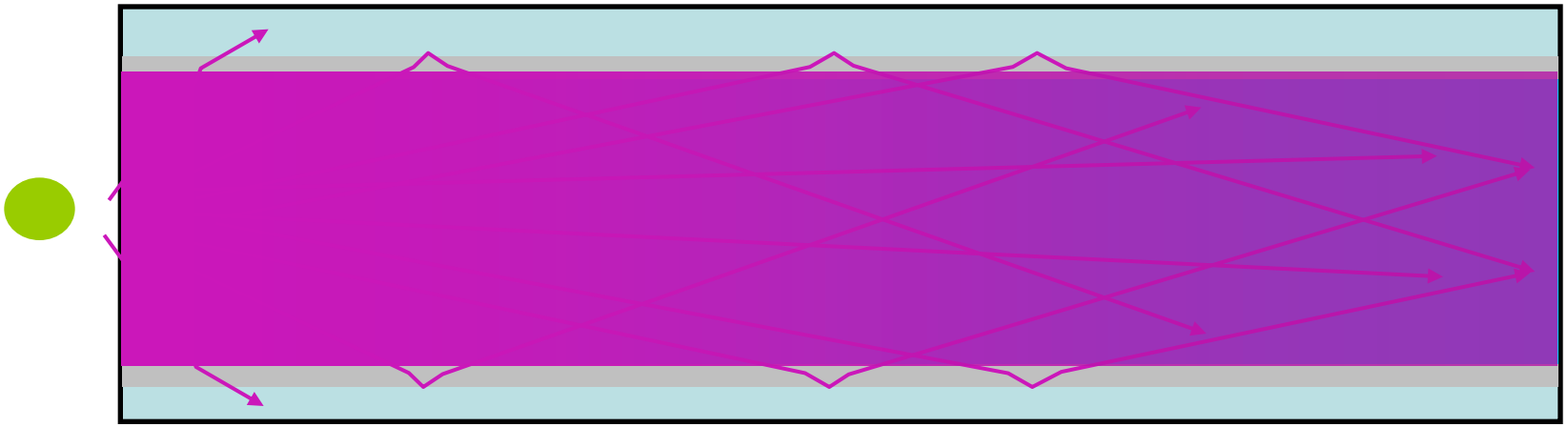
Enlightened Water Technologies

石英管

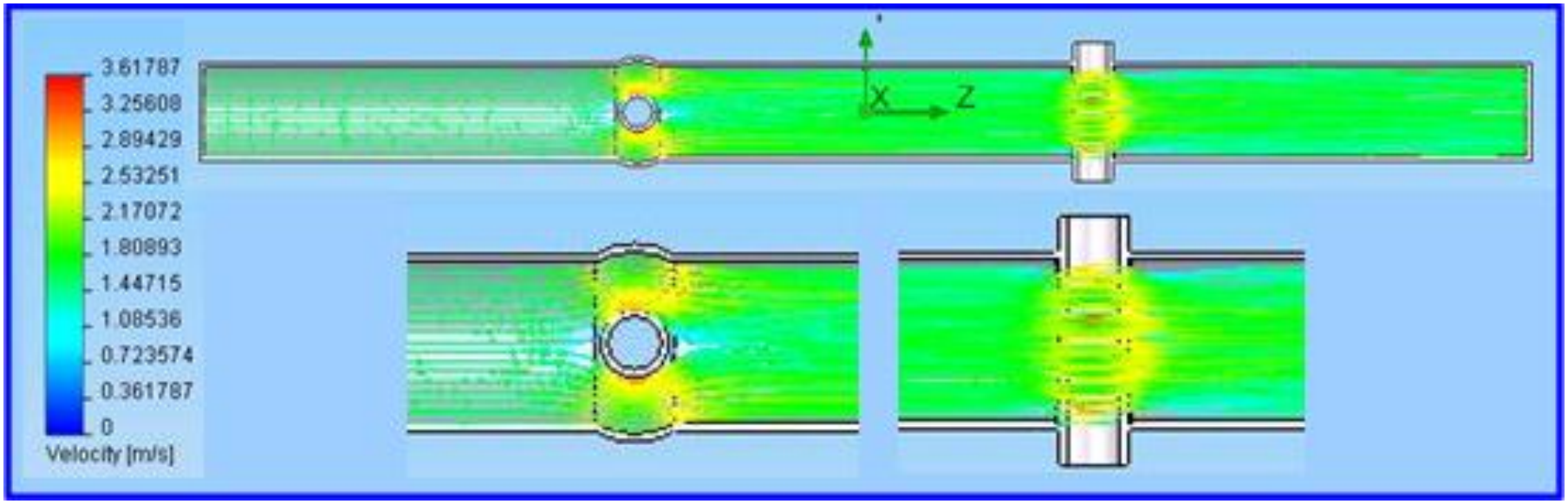
安特蓝德公司的技术原理

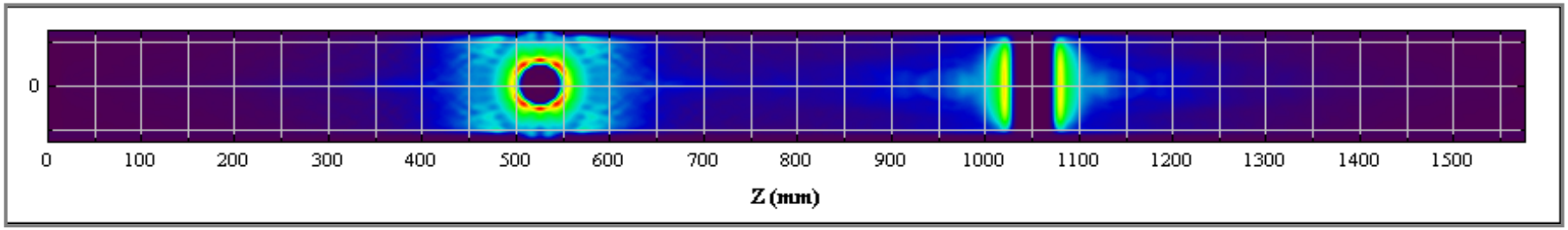
全内反射工作原理（如在光纤中）



采用独特的光学和水力技术，达到史无前例的效果

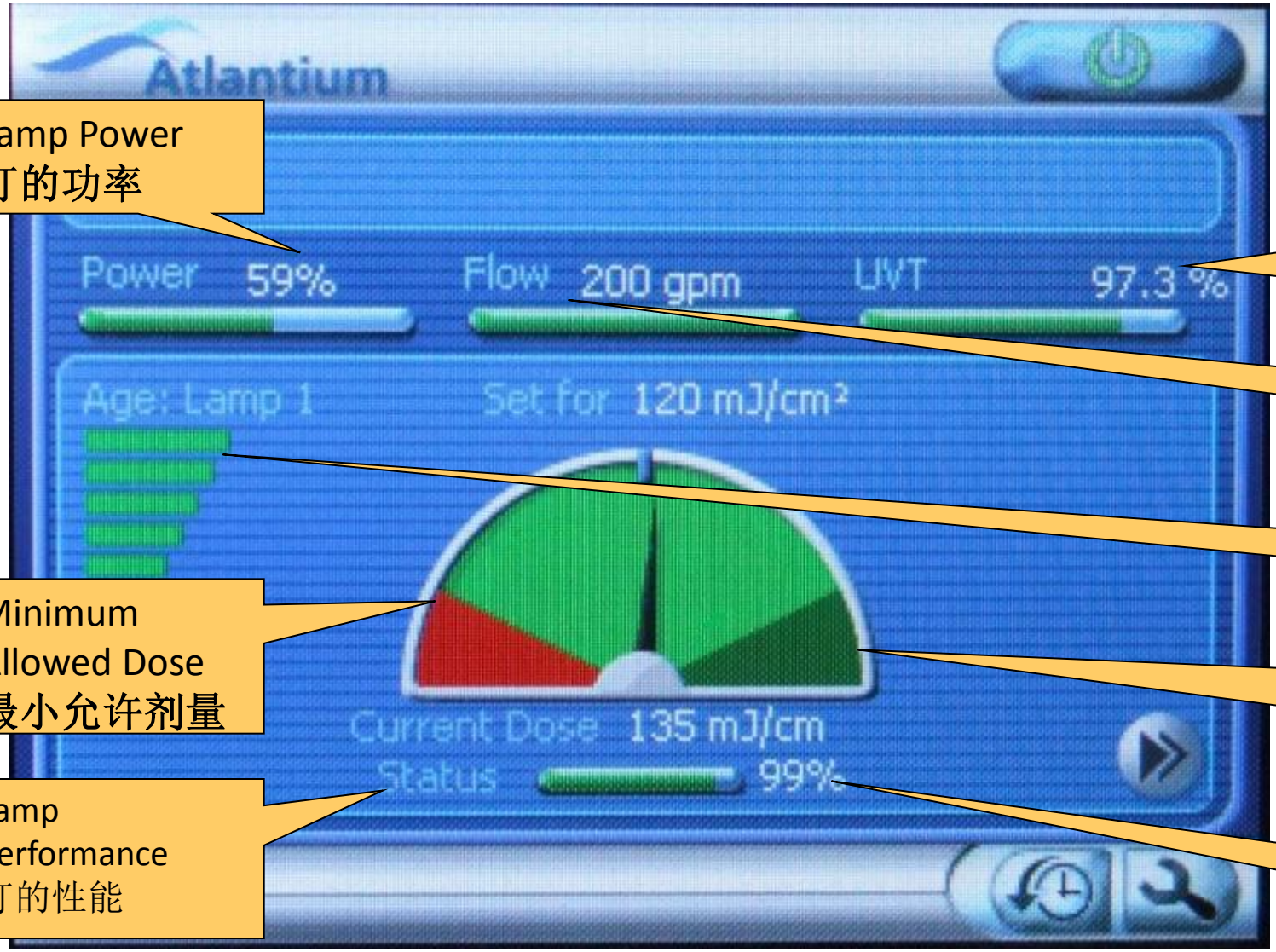
HOD RZ104-12





测量

先进的监控能力



Lamp Power
灯的功率

Real Time UVT
实时 UVT监控

Flow Rate
流速

Lamp Hours
灯的寿命

Minimum Allowed Dose
最小允许剂量

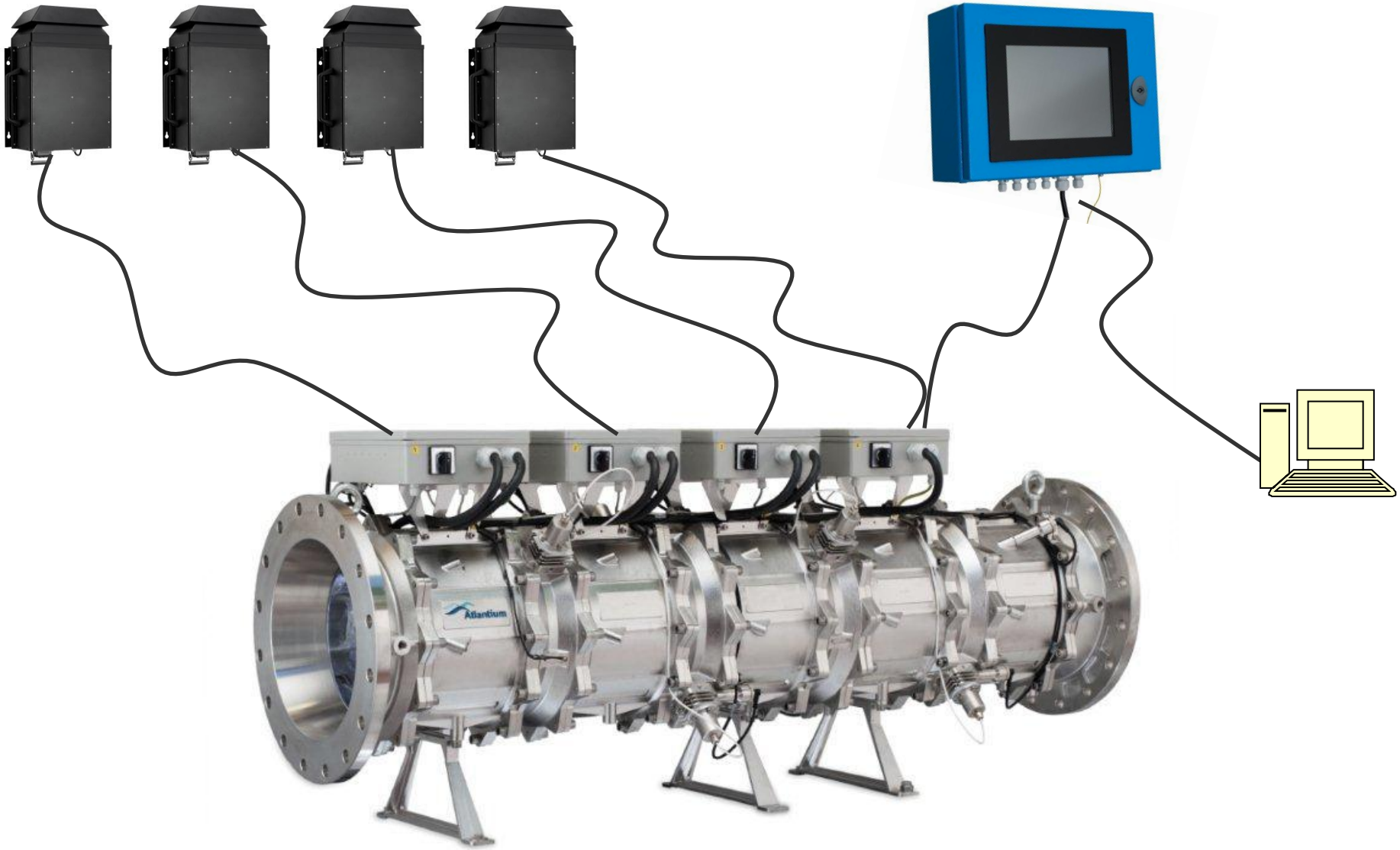
Maximum Allowed Dose
最大允许剂量

Lamp Performance
灯的性能

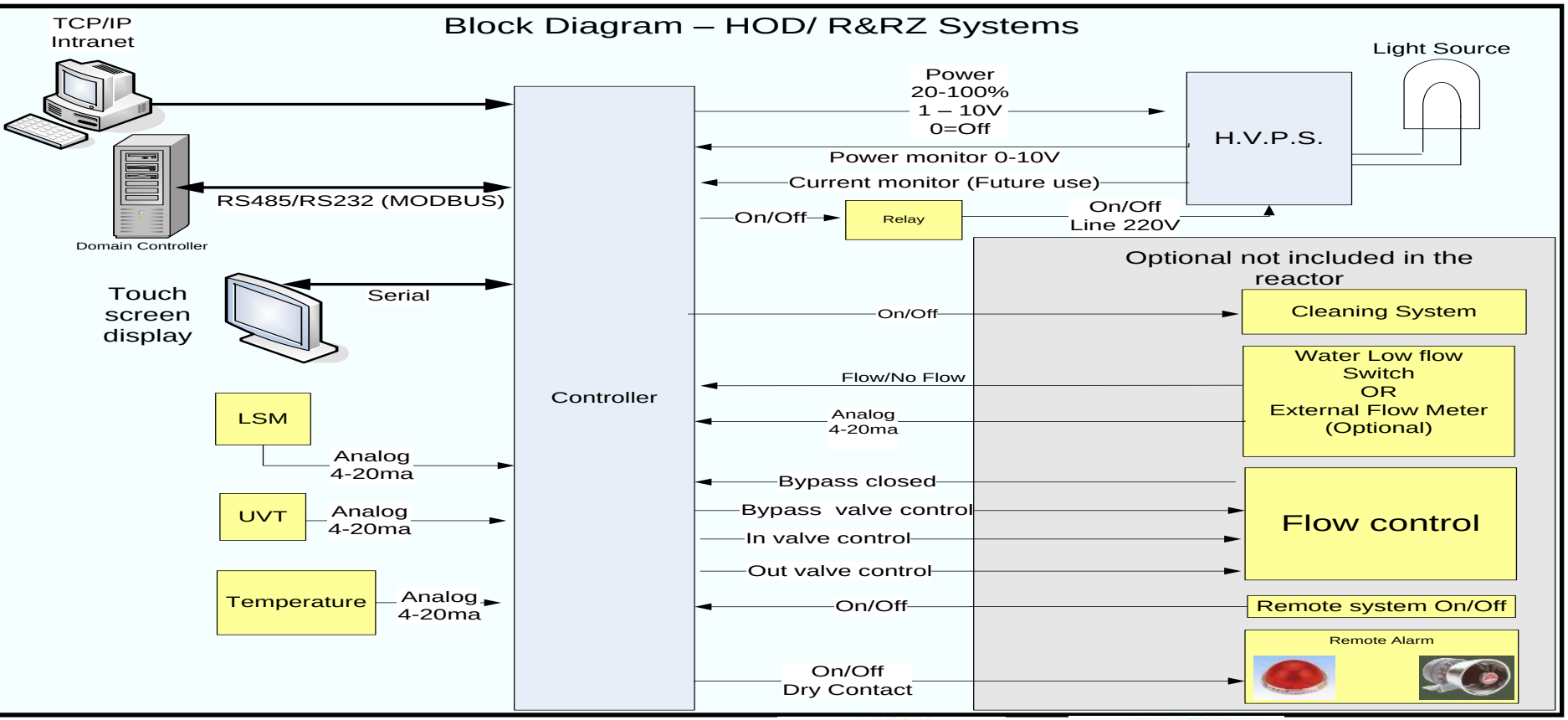
Validated RED
经验证的RED

► Accurate monitoring and real-time control准确的监控和实时控制

HOD 系统组件



综合能力



SMS
短信服务

Control room
控制室

Alarm
报警

Siren
警报器

Internet
网络

Valve
阀门

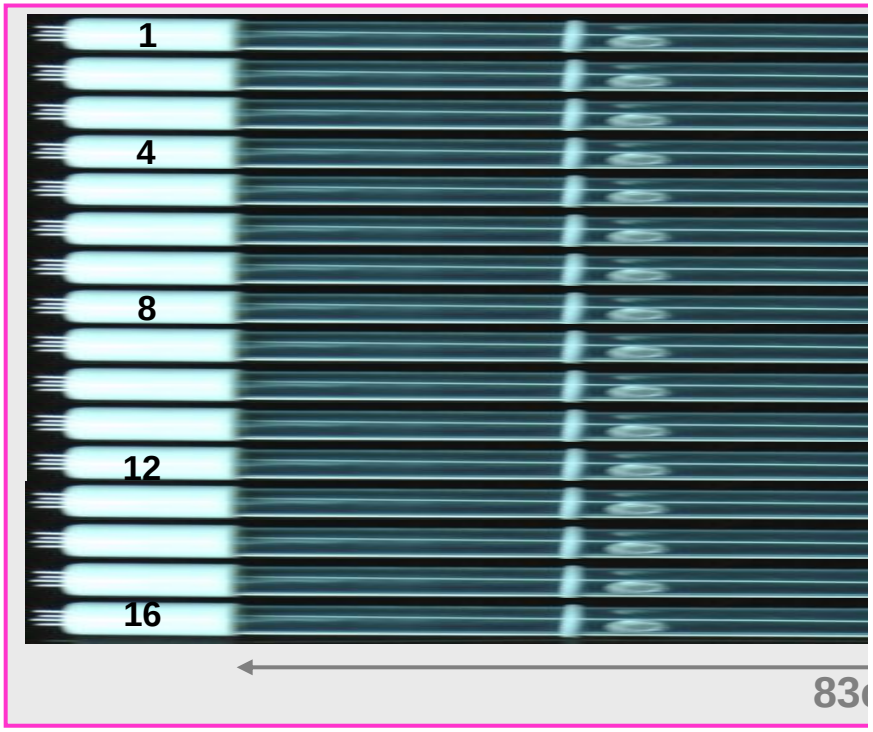
低压 灯 对 中压灯

低压灯 对 中压灯

10cm

中压灯紫外线

- 边缘波长
- 较高的单位灯输出量（减少灯的使用量）
- 对水温不敏感
- 无微生物修复作用
- 输出量可变（**LP**开/关）



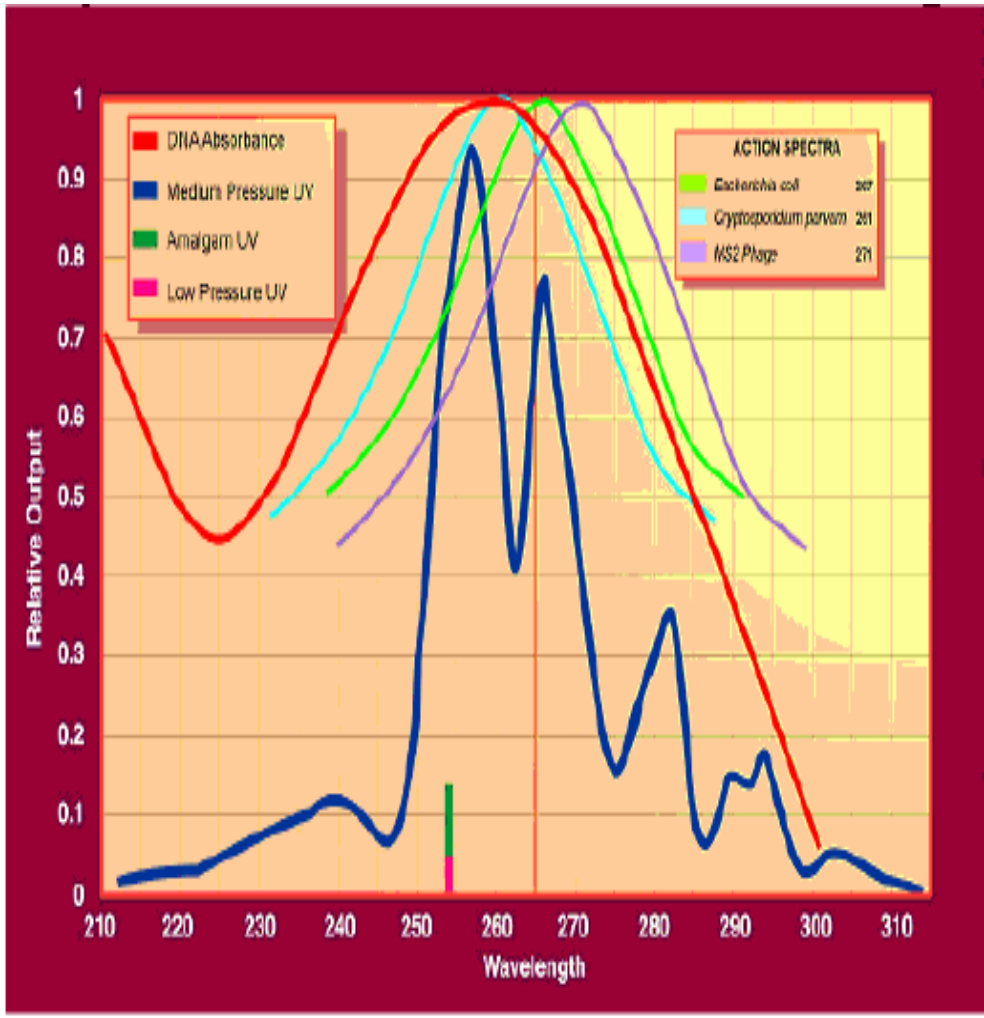
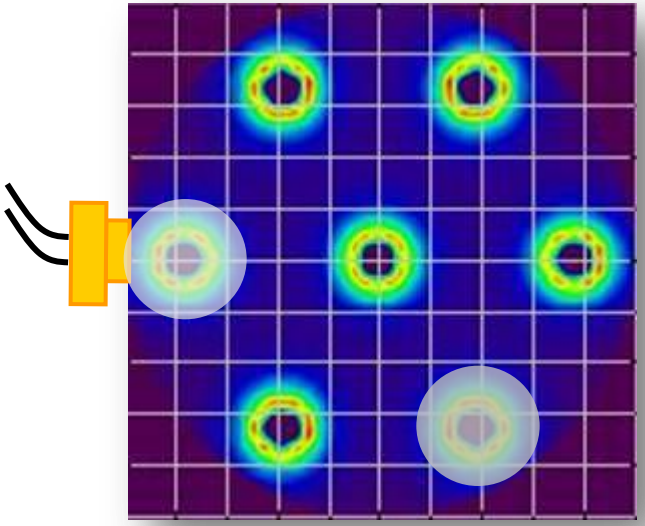
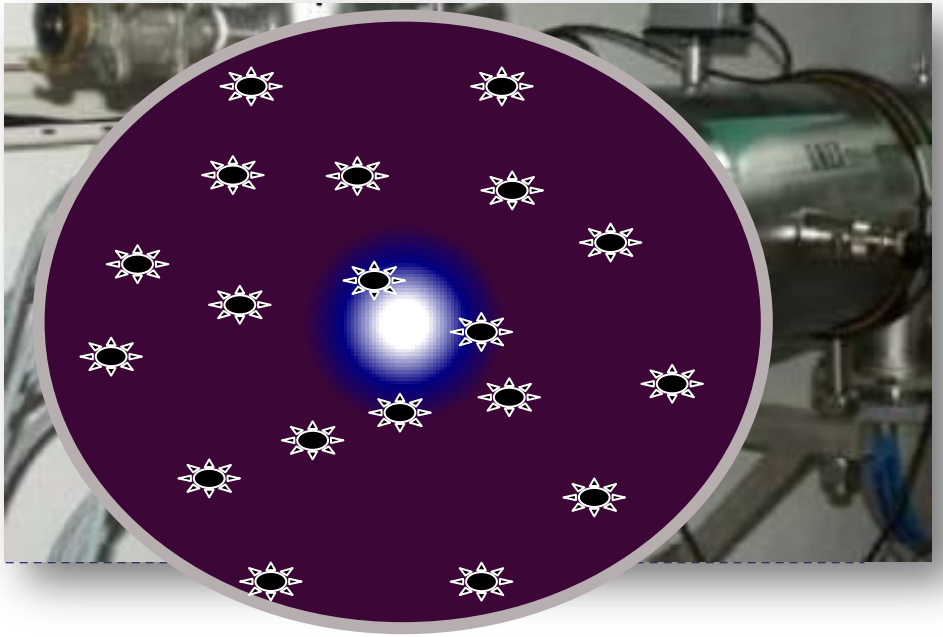


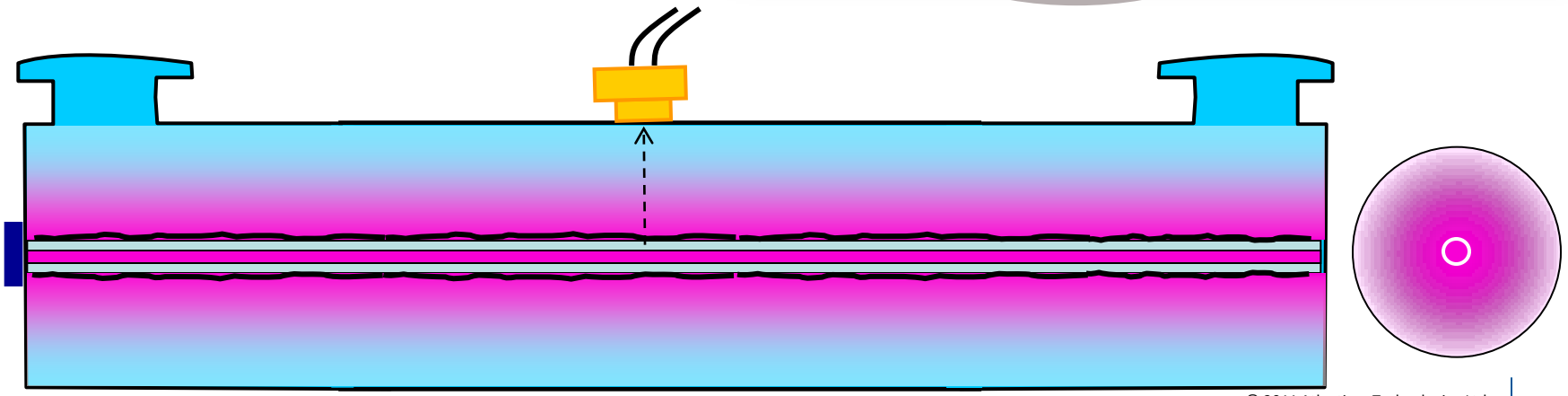
Figure 1: Ultraviolet (UV) radiation in the electromagnetic spectrum.

为什么紫外线是从来没有考虑过作为屏障

传统紫外线





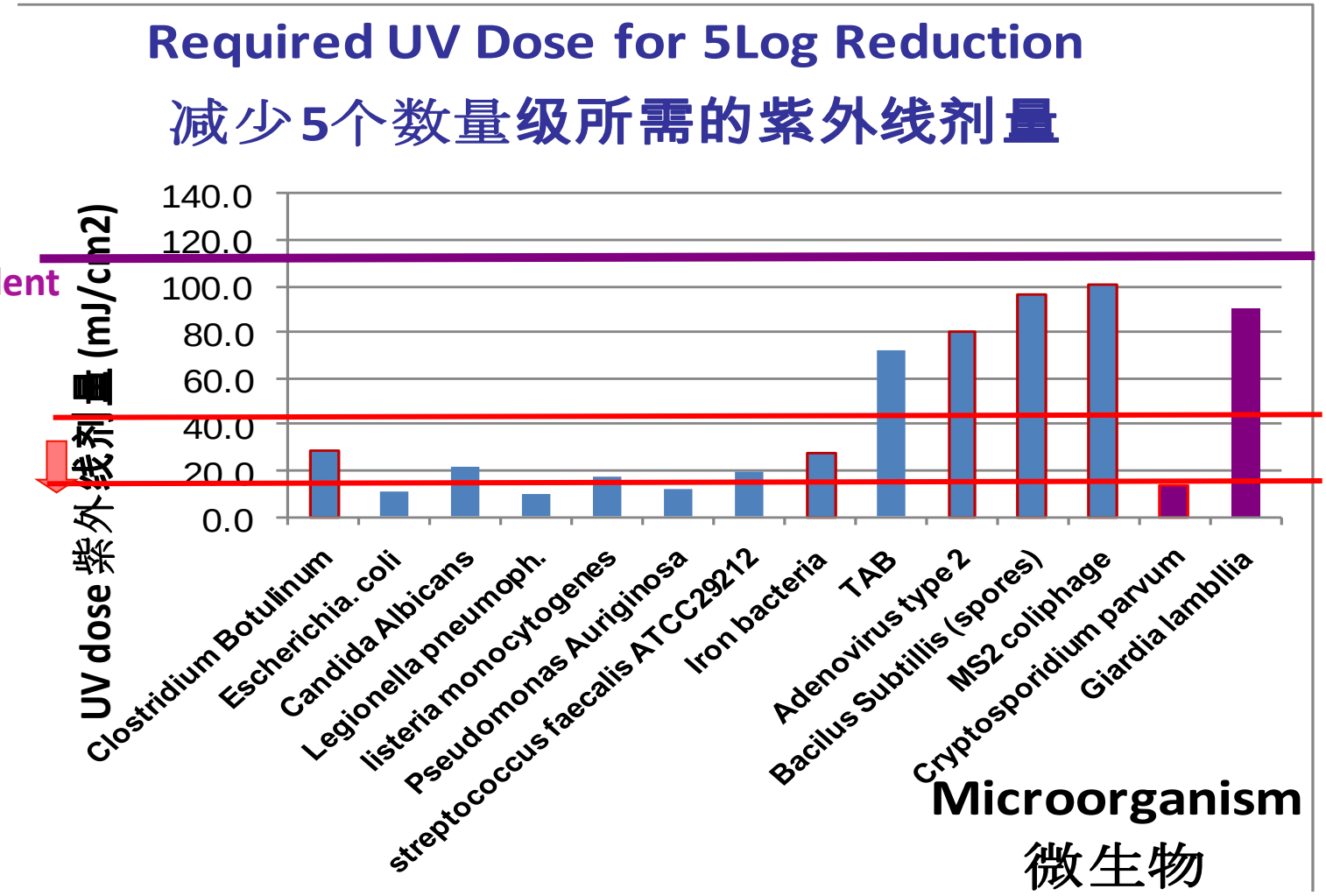


确保适当剂量的设计

120 mJ/cm RED
FDA –
Pasteurized equivalent
巴氏消毒等量物

40mJ/cm² Average

16mJ/cm² RED



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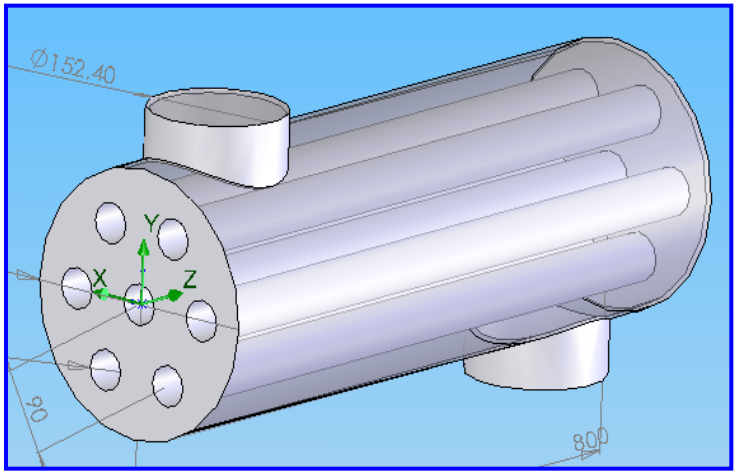
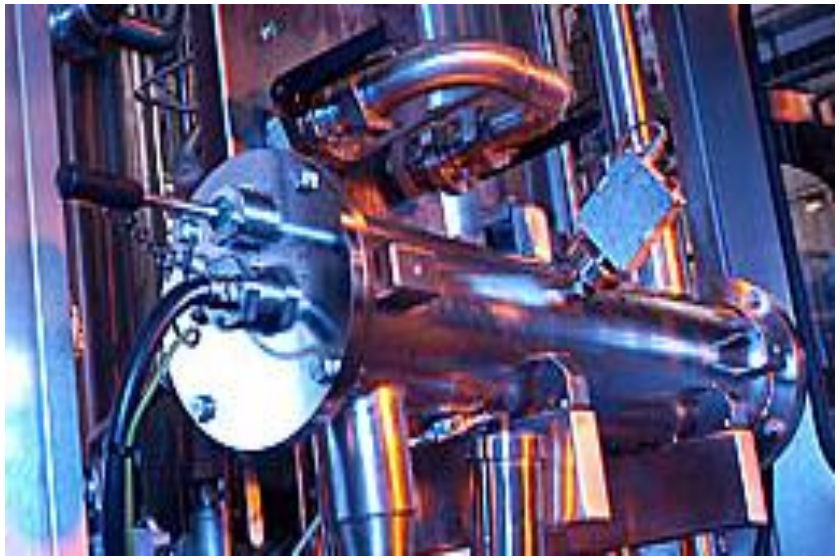
传统紫外线 设计

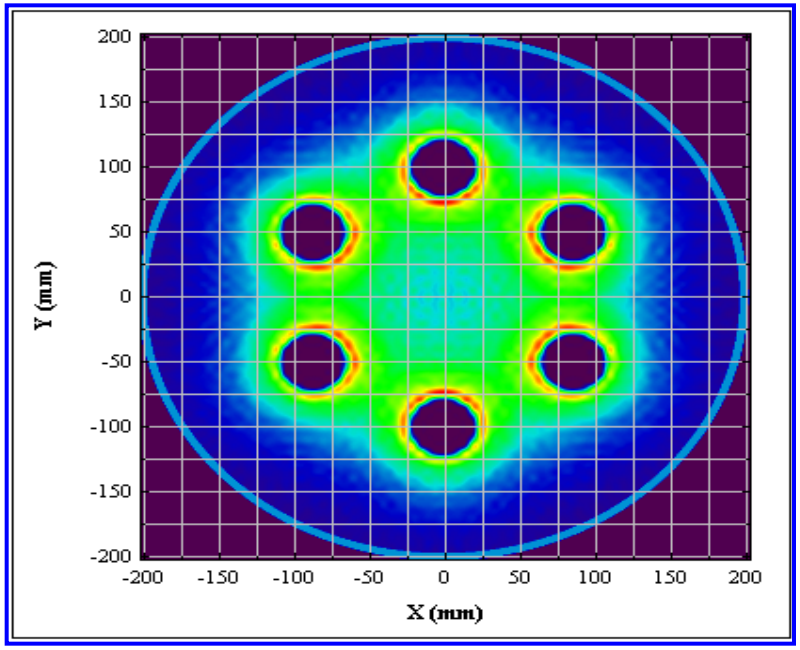
紫外线测量：老方法

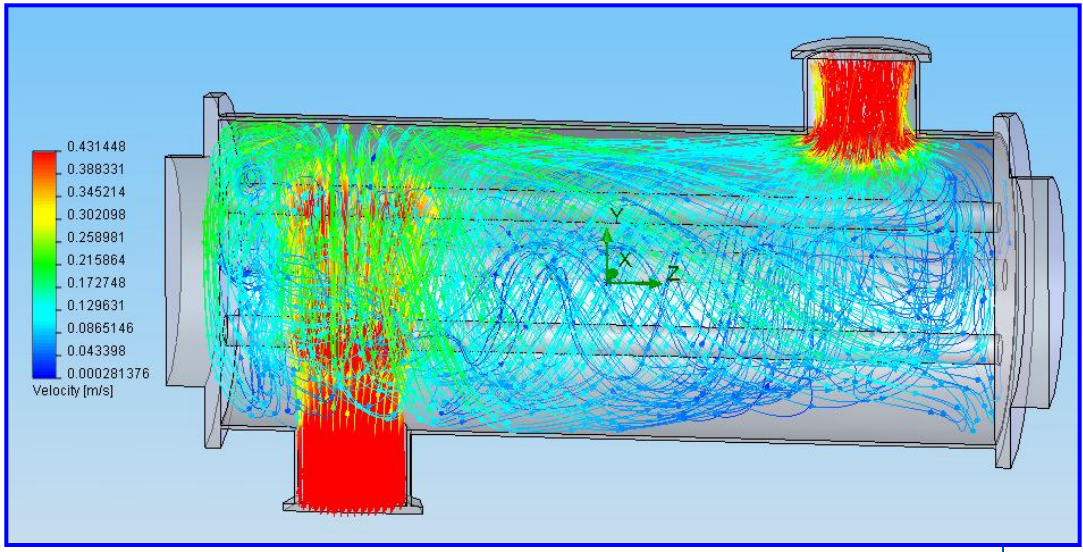
- 定点方法侧重警报功能
  - 无标准命名惯例
  - 通常用PSS-点源总和计算平均剂量
  - 按小时“计”，而非按剂量“计”
  - 如果使用，生物检定而非当前剂量决定传感器读数基数
  - 一般不对UVT进行测量
  - 老化/污垢因素不直接列入考虑范围
  - 不是很直观：显示相对的感应器读数，而非剂量；无必要关联
  - 操作简单，但随变流时间的延长成本较高

N









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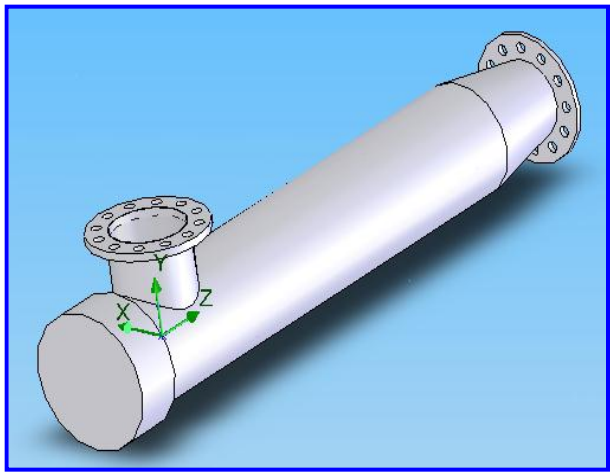

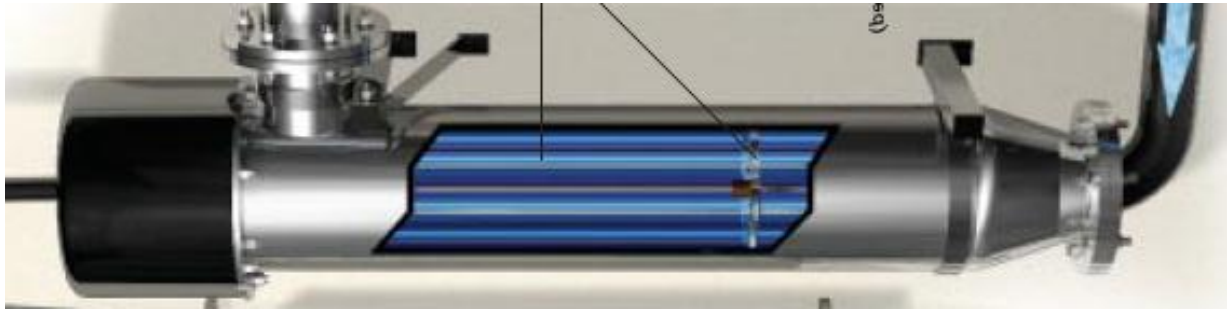

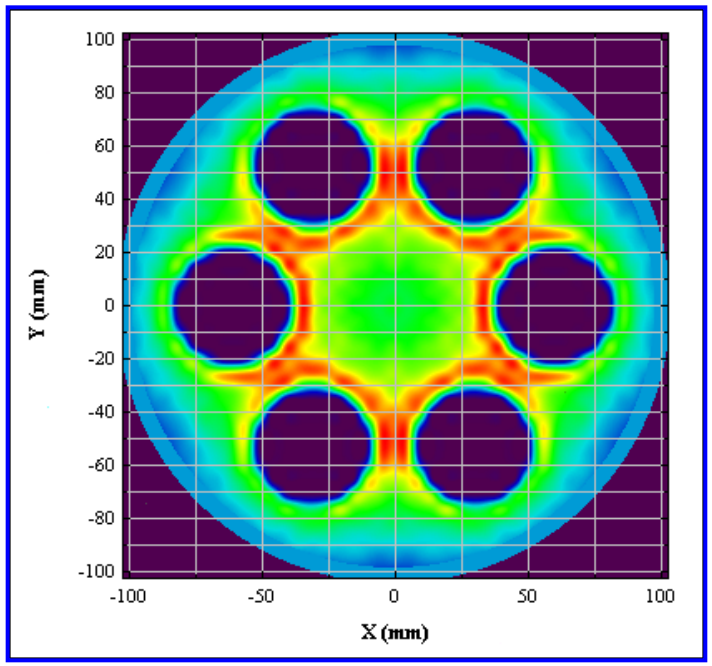

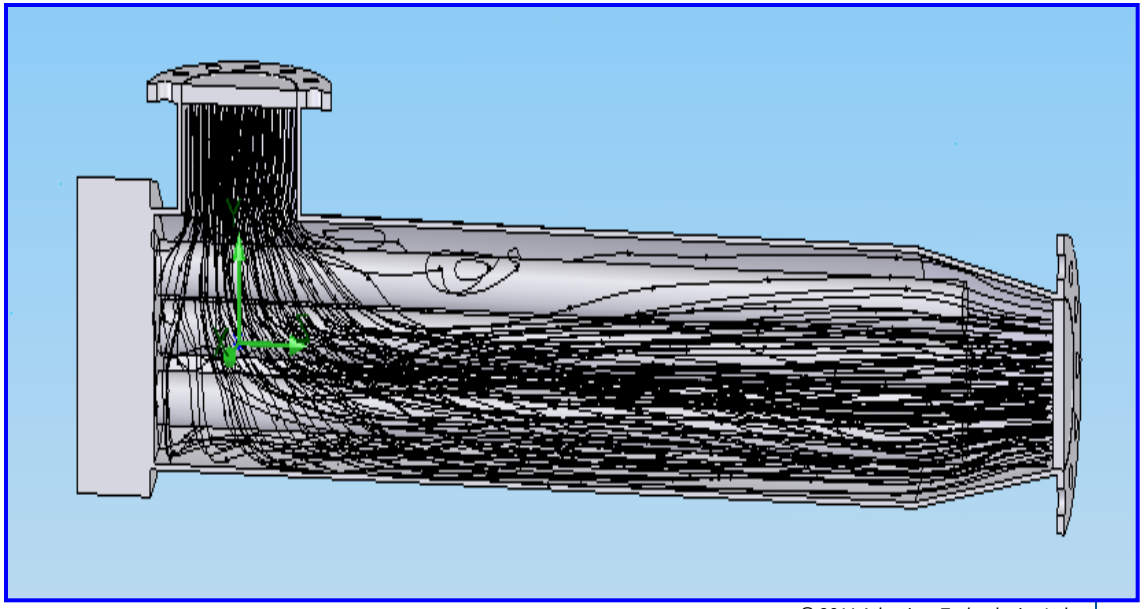

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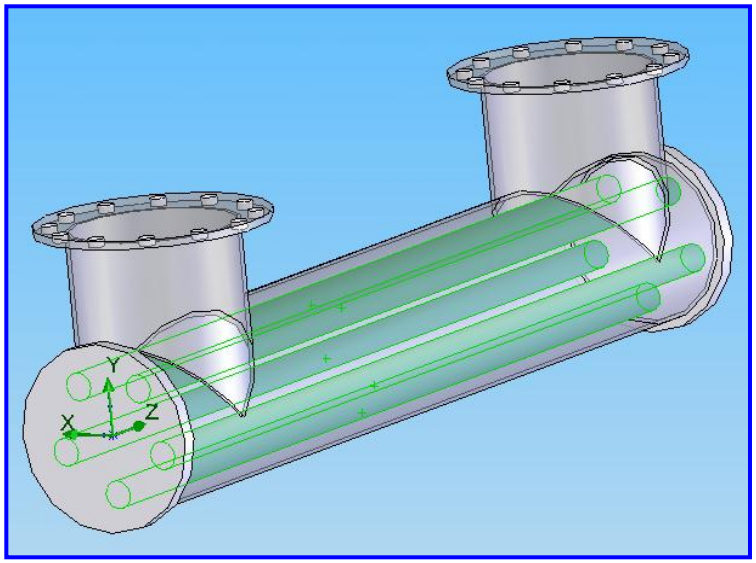
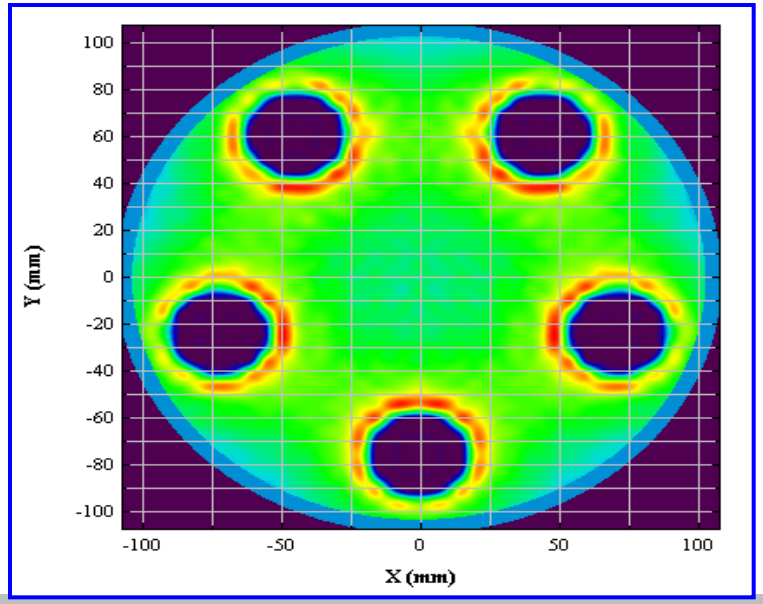
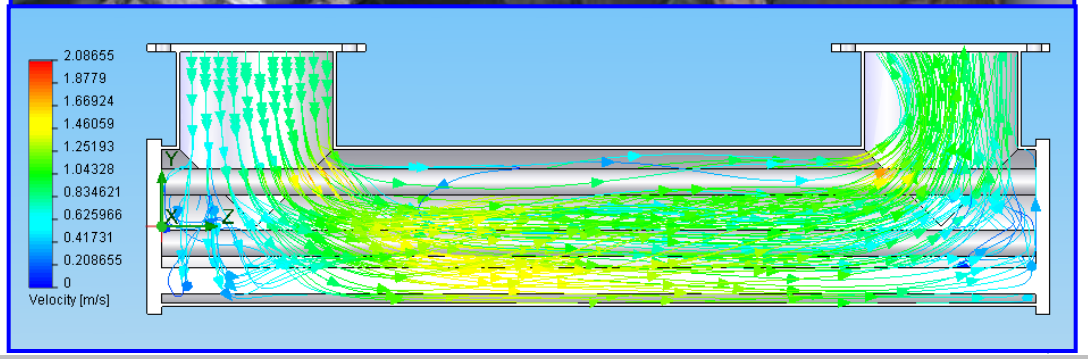
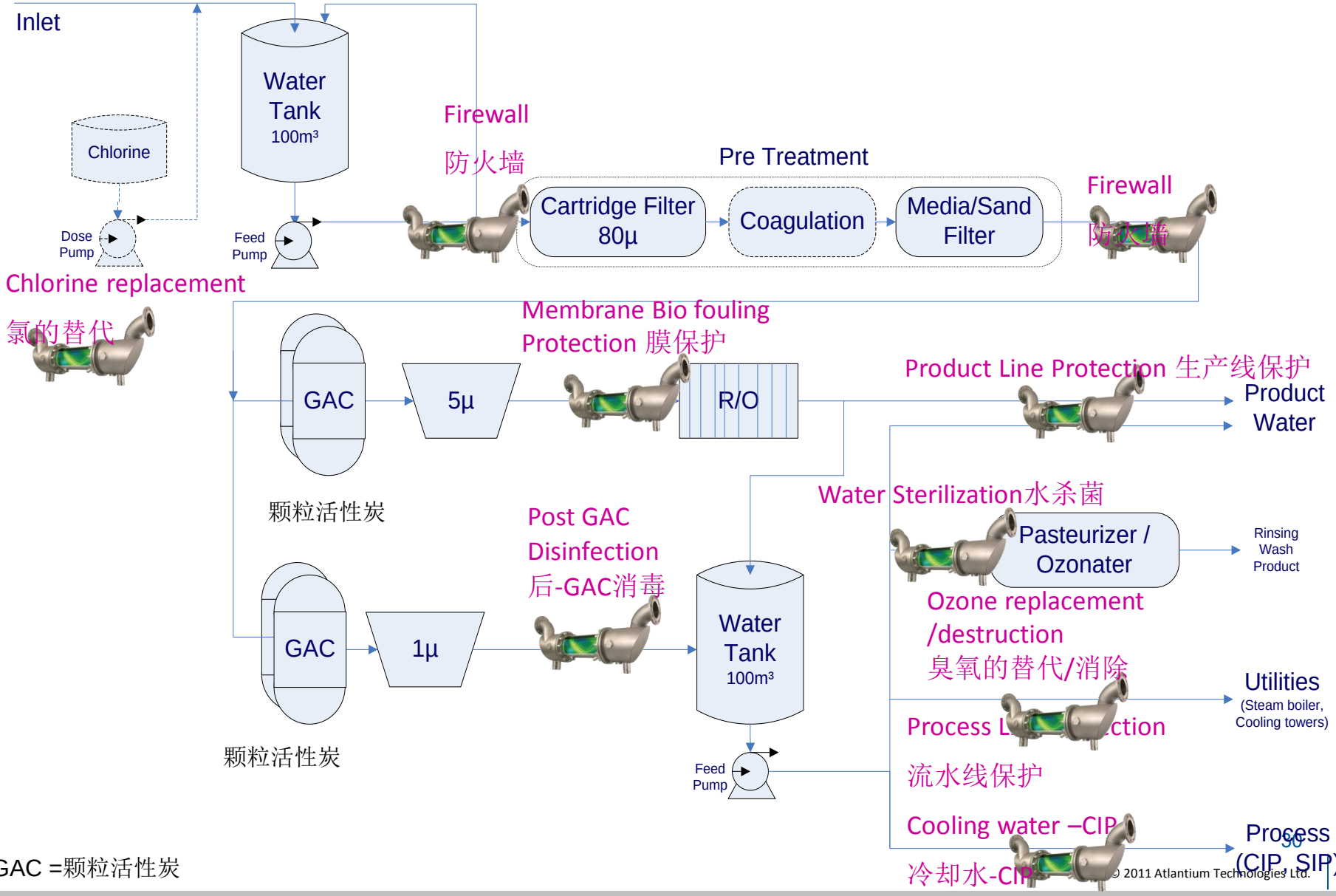






应用系统

增值应用系统



GAC =颗粒活性炭

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点 亮 水 技 术

UV Water Treatment
Atlantium Hydro-Optic™ Solutions

Food & Beverage Industry

Talya Shaharabani/塔力亚
China Country Manager/中国区域经理

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