Tracking the Latest Developments in Air Pollution Control Technology

大气污染控制技术进展即时信息追踪系统

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Outline

- **Sharing our World's Knowledge in Environmental Technologies**

  分享我们在环境技术领域中所建立的世界信息系统

- **Carbon Capture and Sequestration（二氧化碳捕集与封存）**
- **NOx issues（氮氧化物控制问题）**
- **Mercury issues （汞排放问题）**
- **Fine Particulate issues （细粒子问题问题）**
- **SO_2 removal issues （脱硫问题）**
- **Monitoring and Measurement issues（监测问题）**

Sharing the Worlds Knowledge

- Mcilvaine Company是能源环境技术资讯与咨询公司，致力于在用户与产品或技术提供商之间建立起一座便捷的沟通渠道。
  - 关注世界上的相关技术进展及可应用技术水平
  - 指导供应商如何理解用户的需求
  - 帮助用户了解目前的产品或可利用的技术
  - 帮助投资者评估投资取向

在空气污染控制技术与市场方面的数据信息：

- Power plant air quality decision system with decision trees （UPIS）

  火电厂空气质量决策系统
- Free website with news and factors

  提供环保资讯和要素的免费网站
- Free information on cement plant air toxics

  水泥厂空气污染物质控制的免费信息
- Chinese-English technical dictionary

  中英文技术术语词典
- Rigid structure for air pollution terms

  空气污染项目的刚性结构

Total current knowledge with decision systems on power plant air quality

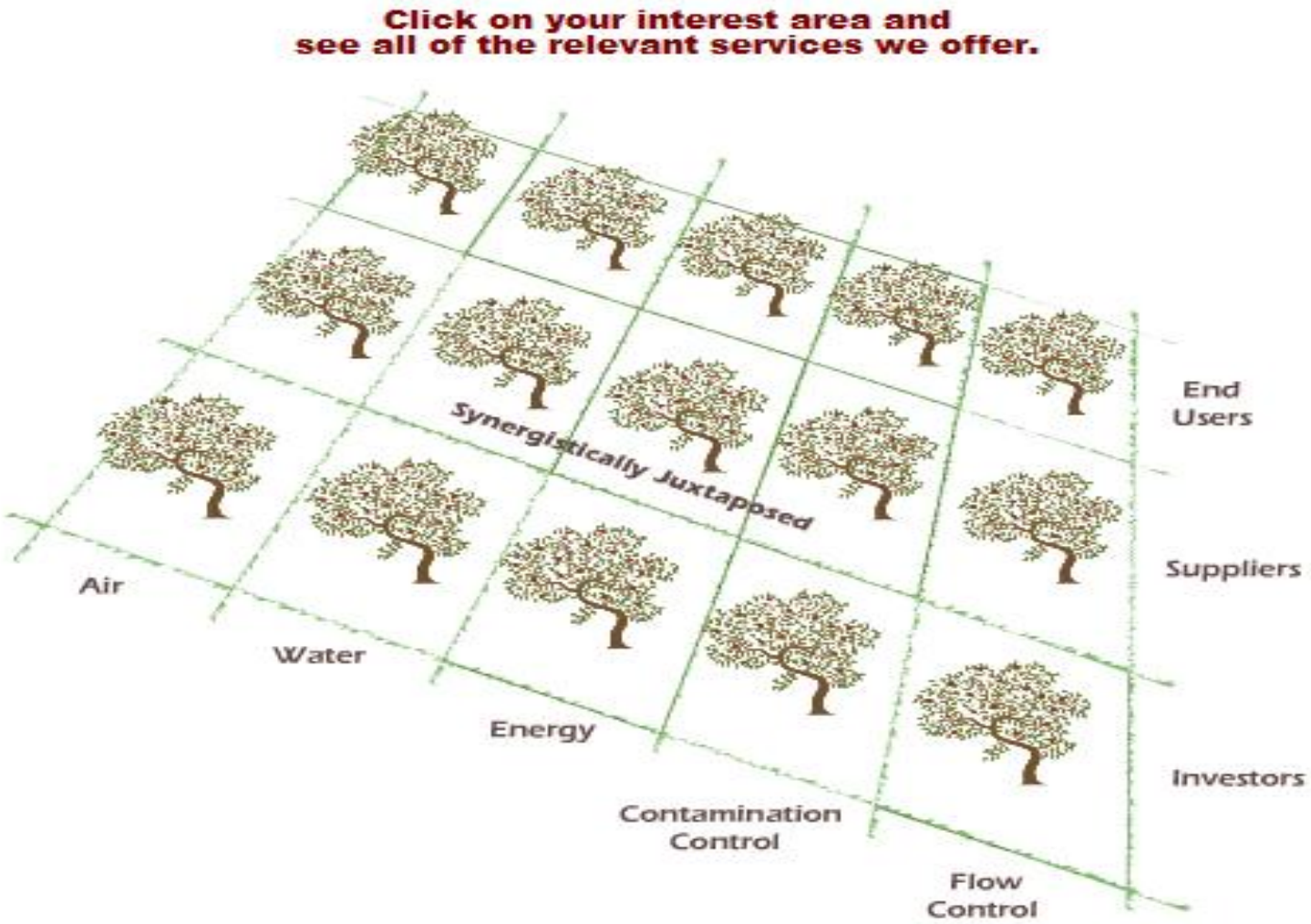
通过决策系统对火电厂空气质量方面的总体认识

In order for information to be of maximum value it must be current and well organized as well as provide the true decision related insights.

There are 4 knowledge Needs 4个重要的认识要求

Alerts 通信	Utility E Alert and 4 monthly newsletters 每周一次的信息博览和每4个月一期的时讯
Answers 答案	Decision trees, and on line library (abstracts） 决策树系统，及在线资料库（摘要）
Analysis 分析	Decision trees and webinars 决策树和网络研讨会
Advancement 提高	Training webinars 高级网络研讨会

Air Decision Trees Overview



AIR SERVICES

Finding the Right Subscription for Your Needs

Click on yellow cells for information

Click here to view sequential list of publications

THE McILVAINE COMPANY WEB SITE

Power Plant Air Quality Decisions

Introduction
Power Plant Air Quality Training
Networking & Hot Topic Hour
Audio Interviews at Conferences
Hot Topic Hour Recordings
Audio/Video Recordings by Person
Audio/Video Recordings by Company
Audio/Video Recordings by Subject
Utility E-Alert

Decision Trees

FGD
Mercury
Particulate
NOx
CO2
Air Quality Search
Energy and Water Decision Tree

Hot Topic Hours & Webinars
热点话题时刻与在线网络会议

- 无论您身在何处，都可通过网络与我们即时讨论；
- 每周我们将就某一专业话题邀请本行业内国际权威专家参与讨论，尤其是国外行业应用的经验的讨论；
- 您可以足不出户地参加热点话题的讨论，聆听本行业内国际权威专家的讲解及问题解决方案；
- 您可以利用我们的网络记录的声像资料，对某一话题寻求答案；
- 热点话题和在线网络会议注重技术发展及市场需求的时效性；

网址：　www.mcilvainecompany.com

April 29, 2010	Advanced Coal Combustion 119 minutes Password: hth419 MORE
April 23, 2010	Impact of Ambient Air Rules for PM 2.5 and Ozone - Part 2 90 minutes Password: hth198 MORE
April 22, 2010	Impact of Ambient Air Rules for PM 2.5 and Ozone - Part 1 120 minutes Password: hth198 MORE
April 16, 2010	Material Handling in Coal Plants - Part 2 105 minutes Password: hth882 MORE
April 15, 2010	Material Handling in Coal Plants - Part 1 132 minutes Password: hth882 MORE
March 25, 2010	Mercury Control or Mercury Removal Status and Cost 156 minutes Password: hth340 MORE
March 18, 2010	Mist Eliminators 71 minutes Password: hth427 MORE
February 25, 2010	Greenhouse Gas Strategies for Coal-fired Plant Operators - Part 2 122 minutes Password: hth960 MORE
February 24, 2010	Greenhouse Gas Strategies for Coal-fired Plant Operators - Part 1 126 minutes Password: hth960 MORE
February 18, 2010	Boiler and Cooling Water Treatment 130 minutes Password: hth642 MORE
February 11, 2010	Fuel Impact on SCR Catalyst 98 minutes Password: hth293 MORE
January 28, 2010	Improving ESP Performance 116 minutes Password: hth219 MORE

CCS (Carbon Capture and storage) 技术解决方案

- 寻求可利用的技术途径

McIlvaine

Home Page

CO2 Decision Tree

Sequential Decision Tree ▮ Keyword Branch ▮ Source/Supplier Branch ▮ Product Branch
Contents ▮ Networking Directory ▮ Utility E-Alerts

The CO2 Sequential Tree Option begins with the basic control decision categories. To move forward in the decision process click on the displayed title which will bring you to all the options at the next decision level.

CO2 Decision Process:

Not Reduce CO2/ Reduce CO2
Reduce CO2

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CO2 Decision Tree

Sequential Decision Tree ▮ Keyword Branch ▮ Source/Supplier Branch ▮ Product Branch
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CO2 Continuing Decision Process For: Reduce CO2

- Capture and Store
- Reduce Emissions
- Co-Fire Biomass
- Replace
- Reduce Demand
- Buy Allowances

CO2 Continuing Decision Process For: Capture and Store

- CO2 Capture
- Compression and Transportation
- CO2 Storage
- Beneficial Reuse

CO2 Continuing Decision Process For: CO2 Capture

- Post-Combustion Capture
- Pre-Combustion Capture
- Oxy-Combustion

Post-Combustion Capture

- Amines/MEA
- Chilled Ammonia
- Dry Sorbents and Carbonates
- Ionic Liquids
- Membranes
- Adsorbents
- Biological Capture

CO2 Decision Tree

Sequential Decision Tree ▮ Keyword Branch ▮ Source/Supplier Branch ▮ Product Branch
Contents ▮ Networking Directory ▮ Utility E-Alerts

Capture and Store ▶ CO2 Capture ▶ Post-Combustion Capture ▶ Amines/MEA

CO2 Continuing Decision Process For: Amines/MEA

Sources
Analysis

Amine solvents
http://www.mcilvainecompany.com/CO2_Decision_Tree/subscriber/Tree/DescriptionTextLinks/Amines MEA.htm

COSTS Table of Contents
http://www.mcilvainecompany.com/CO2_Decision_Tree/subscriber/Tree/DescriptionTextLinks/COSTS.htm

CO2 Continuing Decision Process For: Sources

Cost analysis

- Cansolv
- Mitsubishi
- Fluor
- Alstom
- BASF
- Aker Clean Carbon
- HTC Purenergy
- Toshiba

Cansolv Technologies

Cansolv Technologies, Inc., is a leader in the design and development of regenerable amine-based gas scrubbing technologies. nine units in operation and several more in engineering or construction phases. The Cansolv CO_2 capture process has been de Canada, Japan and Norway.

The only pilot at a coal-fired power plant occurred at ***Saskpower's Poplar River Plant*** in Canada from July to September 2(beginning in late 2009, on a 1% slipstream from ***E.On's Heyden Power Plant*** in Germany.
http://www.cansolv.com/rtecontent/document/CO2Pilotplant2009.pdf

Cansolv's CO_2 capture system is based on a standard amine absorption/stripper configuration using a proprietary DC101™ sc environmental controls. The gas then flows up the absorption column where it mixes and reacts with an amine solution. The tre the plant. The CO_2-loaded solvent goes to a thermal stripper which separates the CO_2 stream and regenerates the solvent. Ca system which takes advantage of the similarities between amine scrubbing technologies.
http://www.co2captureandstorage.info/docs/capture/11th%20Mtg/06-03%20--%20C.%20Ryan%20(Cansolv).pdf

NOx issues and solutions
氮氧化物控制问题及解决方法

Catalyst creates SO3 催化剂产生SO3	Change to new design catalyst 替换新的催化剂
Catalyst plugs with ash 催化剂堵塞	Clean , change pitch or add screen 清洁，改变催化剂空腔或者增设滤网
Ammonia injection grid fouls 氨喷射格栅出错	Buy higher grade ammonia 提高氨反应剂的纯度
NH3 slip　氨气逃逸	Improve distribution　改进氨分布方案
Short catalyst life 催化剂寿命短	Clean in place or send to outside facility 定期清洗或出厂处理
Does not oxidize mercury 不能氧化汞	Change to mercury oxidizing catalyst 替换成可以氧化汞的催化剂
Insufficient room for SCR SCR空间不足	Use tail end SCR with heat exchanger ？？
Inadequate efficiency 脱氮效率低	Add SNCR or in duct catalyst 增设SNCR装置或采用抗尘催化剂

Mercury Issues 汞排放问题

- Add activated carbon (A.C) before air pre- heater

  在空气预热器前加入活性炭
- Brominated A.C. better but more expensive

  溴化活性炭效果更好，但成本更高
- Cement friendly carbon allows sale of fly ash

  含有碳吸附飞灰的允许销售的水泥
- Halogen additives make scrubbers efficient

  卤素添加剂可以提高洗涤/吸收塔的效果
- Alternative sorbents include silicates

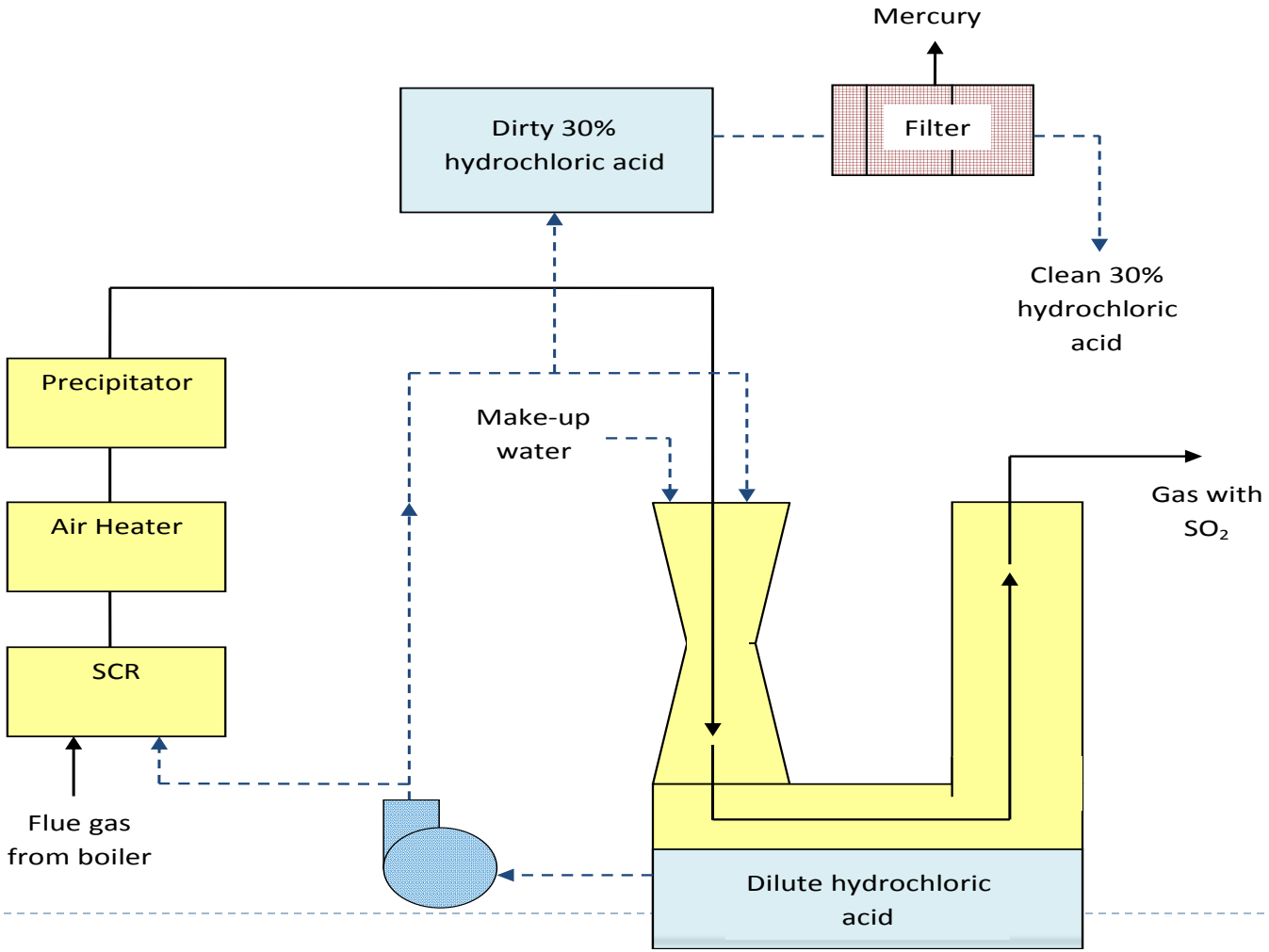
  可替换的吸收剂还有硅酸盐
- A.C. or chemicals in scrubber prevent re-emission

  洗涤/吸收塔活性炭或其它化学物质会阻止再次排放

Two stage scrubber for HCl and SO2

HCl和SO2气体的两级净化器

HYDROCHLORIC ACID PRODUCTION



Particulate Issues 细颗粒物控制

- Toxic metals not proportional to total emissions.

  重金属排放与总污染排放不成比例。

- Some metals are 1000 X as hazardous as others.

  某些重金属危害度高出其它重金属数千倍。

- Mercury and selenium are vapors.

  汞和硒存在于蒸气中。

- Total particulate includes condensable such as SO_3.

  细颗粒物包括一些冷凝液体，如SO3

- Fine particles below 0.1 microns will pass through absolute filter.

  低于0.1微米的细颗粒物会通过现有的过滤装置。

Particulate Solutions 细颗粒物治理方法

- SO_3 can be captured with lime injection ahead of air pre heater.

  在空气预热器前喷射石灰可以吸收SO3细颗粒物。

- Selenium can also be captured by activated carbon or sodium injection.

  可以用活性炭或者喷射钠碱来吸收硒细颗粒物。

- Fine particulate can be captured with membrane bags.

  极细的颗粒物可以用滤膜来吸收。

- Wet precipitators are efficient on both liquid and solid particles.

  对于液体和固体颗粒物，湿的除尘器都是有效的。

SO_2 Options to wet limestone 湿法石灰石脱硫

Spray drier (lime) 石灰喷雾干燥	Efficiency limited by the acid gas point 酸性烟气露点以下，效率有限
CDS (lime)	More efficient than spray drier but less than wet scrubber 比喷雾干燥法效率高，但比湿法吸收塔效率低
JBR	Efficient, removes dust, but more fan horsepower 更有效，去除粉尘，但是消耗更多的风机马力
Spray tower 喷雾塔	Very large slurry quantities needed for high efficiency 体积巨大，高效脱氯需要更多的石灰泥浆
Tray tower 板式塔	More efficient than spray but more tendency for plugging 比喷雾干燥法效率高，但是更有可能阻塞
Lime instead of Limestone石灰代替石灰石	More efficient but greater cost of reagent 脱硫效率提高，但是脱硫剂成本增加
Inhibited oxidation 抑制氧化	Encapsulates heavy metals but can not be used as gypsum 封装重金属，但是不能用于生成石膏产品
Ammonia 氨法脱硫	Sell ammonium sulfate but watch out for blue plume 可以出售硫铵产品，但是要小心蓝烟现象
Dilute sulfuric acid 稀硫酸	Several processes available to make acid but high capital cost 有几种工艺可以用烟气来制取稀硫酸，但成本较高

Monitoring Issues 监测问题

- Difficult to measure raw mercury and therefore percent reduction.
  很难检测燃料中原汞的含量，所以也难以按比例减排。
- Particulate monitors before scrubber are meaningless.
  洗涤/吸收器之前的细颗粒物监测是没有意义的。
- Few particulate monitors can measure in wet stack.
  很少有细颗粒物检测器可以用于湿污染物堆放场。
- Difficulty in measuring low quantities of NH3.
  很难检测低浓度的氨气。
- Measuring total particulate with condensable is not yet standardized.
  检测包含液体凝结物的细颗粒物还没有标准化。

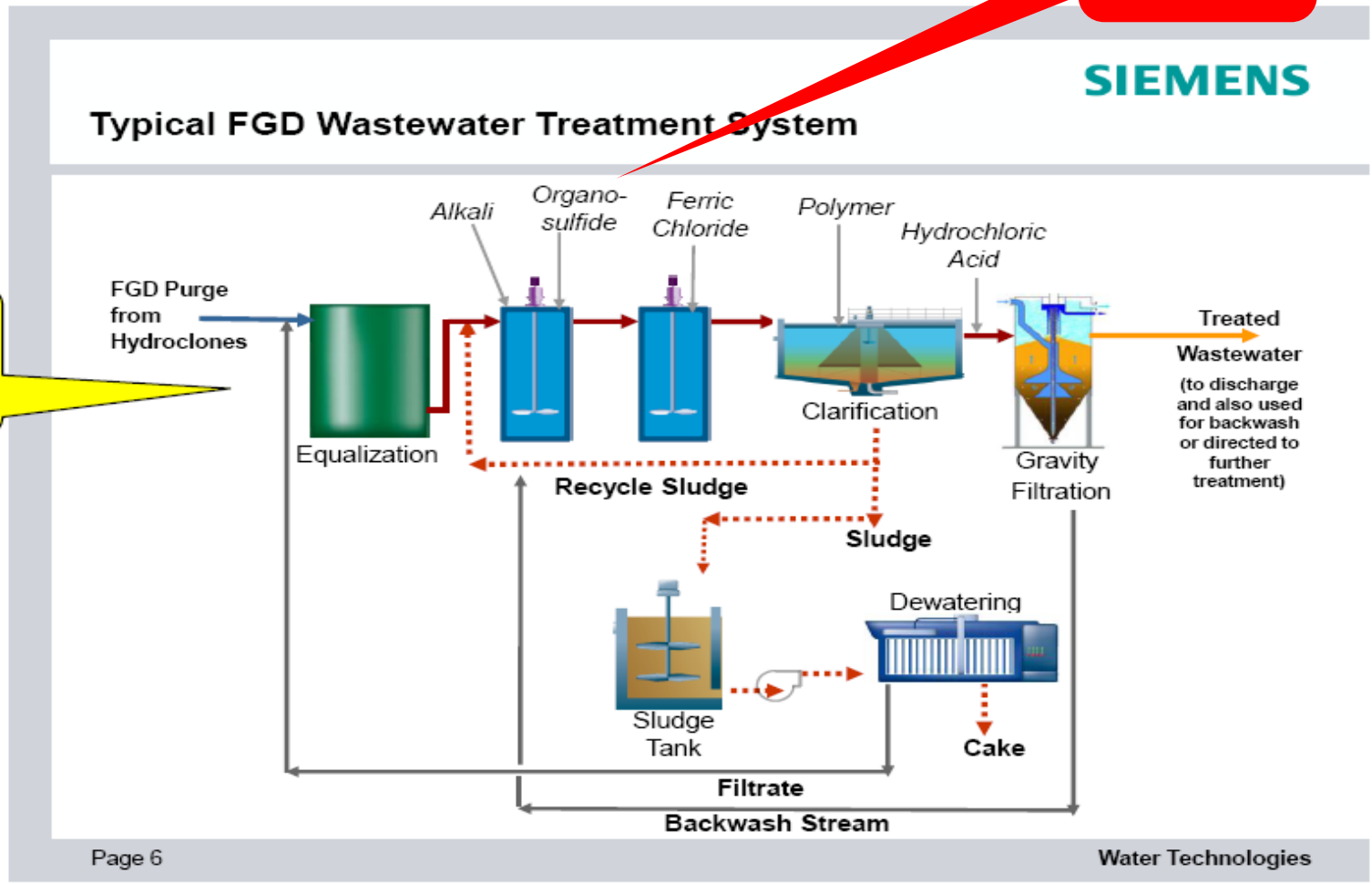
Wastewater issues 废水处理

- More efficient scrubbers mean more contaminants in wastewater.
  更高效的洗涤器意味着需要处理废水中的更多的污染物。
- Selenium is one of the main concerns.
  硒是主要污染物中的一种。
- Metal alloy grinding balls contribute toxic metals.
  合金磨球是有毒重金属的来源。
- HCl pre –scrubber solves this problem.
  HCl预吸收器解决这类问题。
- Zero liquid Discharge (ZLD) is alternative to conventional treatment.
  零废水排放可以替代常规的处理方法。

Typical FGD wastewater treatment
典型的烟气脱硫废水处理系统

Chemical injections

Injection pumps for treatment chemicals, plus sludge handling pumps.



Summary 总结

- China has much wet limestone FGD and precipitator experience but can benefit from world knowledge about acid gases and air toxics.

  中国拥有很多的湿法石灰石脱硫和除尘经验，仍然可以从世界其它地区获取酸性气体和空气有毒物的治理经验。

- There are many new developments which will change design choices in the future.

  在未来，许多技术进步将会改变设计的选择。

- A thesaurus of standardized terms in English and Chinese is desirable to better gain world knowledge.

  需要一个标准化的中英文词典来获取全世界的认识。

- Organization of knowledge into a global orchard of synergistically juxtaposed decision trees will benefit the world.

  把每个行业的应用经验编制成一个全球性的决策树系统将会让全世界受益。

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谢 谢！

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