Demineralization and Degasification

Overview of the website and knowledge system program
# Power Plant Ultrapure Water Market

<table>
<thead>
<tr>
<th>Generation type</th>
<th>MW (1000)</th>
<th>Capital $ millions</th>
<th>Consumable and repair parts $ millions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas turbine new</td>
<td>70</td>
<td>2800</td>
<td></td>
</tr>
<tr>
<td>Gas turbine existing</td>
<td>1200</td>
<td>2400</td>
<td>3000</td>
</tr>
<tr>
<td>Coal fired power new</td>
<td>90</td>
<td>7200</td>
<td></td>
</tr>
<tr>
<td>Coal fired power existing</td>
<td>2000</td>
<td>8000</td>
<td>9,000</td>
</tr>
<tr>
<td>Nuclear new</td>
<td>9</td>
<td>900</td>
<td></td>
</tr>
<tr>
<td>Nuclear existing</td>
<td>430</td>
<td>1000</td>
<td>1400</td>
</tr>
<tr>
<td>total</td>
<td></td>
<td>22,300</td>
<td>13,400</td>
</tr>
</tbody>
</table>
Processes

• Coal fired, gas turbine combined cycle. Nuclear, and concentrated solar power plants all use the same technologies for purifying the water which is converted to steam to drive the electric generator.

• The major difference is that only a portion of the power is derived from steam generation in gas turbine combined cycle plants. However, there is a unique additional need for ultrapure water in some gas turbine plants. In dry hot climates water is introduced through fogging nozzles to reduce the inlet air temperature to the turbine.

• The system includes a series of processes starting with purification of the raw water. Particulate soluble species and gases are removed. High purity is needed to avoid fouling in boiler tubes as well as high temperature corrosion.

• Treatment is required both for the new water entering the cycle and for the condensed steam
Equipment and Consumables

- Equipment requirements are filters, piping, pumps, valves, ion exchange or electrodeionzation units, feedwater heaters, deareators, degasifiers, condensers and instrumentation.
- Consumables and repair parts include chemicals, seals, membranes, cartridges, pump and valve parts, sensors, I.E resins, nozzles, packing etc. Corrosion inhibitors and anti scalant chemicals are a significant portion of the total.
- Due to the activity in Asia the investment in ultrapure water systems for coal fired plants in 2015 will exceed that of nuclear and gas turbine combined cycle plants combined.
Knowledge System Concept

• Free services are now available to power plants around the world
• Demineralization and degasification are included in a separate website but also as part of larger websites
• **Degasification and Demineralization** is the dedicated website
• **Gas Turbine and Combined Cycle Decisions** is one of the complete knowledge systems
Function of Knowledge Systems

• Empower power plants to select the best products and services
• Provide international knowledge and experience to developing countries
• Share knowledge among disparate geographies, technologies, and job functions
• Identify niche experts
• Cultivate greater expertise in narrower niches
• Lead power plants to other resources such as conferences, magazines, associations, and government services
UPW Global Decisions System (GDPS) helps power plants make best decisions.
You need to revisit tentative choices based on findings at the next stop.

Decision Trees in UPW GdPS Route Map:
- Water sources → Treatment needs → Chemicals → Hardware
- Water permit → Safety and water regs
Process options have to be based on cost, safety and environmental regs

- Water quality needs vs water sources and blowdown quantities
- Water quality needs vs operating hours/yr
- Water quality needs vs hardware choices
- Water discharge regulations vs hardware choices—mercury in sulfuric acid
- Safety regulations vs hardware choices
Hardware choices

- Screens vs automatic filters vs clarifiers
- Sand filters vs cartridges vs microfiltration
- Forced draft deaeration vs membrane contactors
- Ion exchange vs electrodeionization
- UPW and fogging nozzles vs air conditioning
- Optical vs chemical dissolved oxygen sensors
- Decisive classification reduces first cut to just optical vs the traditional optical and multiple chemical such as polarographic and chemiluminescent. This is because optical is as popular as all the chemical options combined
Decisive Classification of all options in Chinese and English

<table>
<thead>
<tr>
<th>Major Class</th>
<th>Descriptor</th>
<th>Chinese Descriptor</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td>Cleaning Catalyst</td>
<td>催化？ 除灰</td>
<td>A dry process that utilizes vacuum and compressed air to mechanically remove as much of the fly ash accumulation as possible.</td>
</tr>
<tr>
<td>Product</td>
<td>Regeneration Catalyst</td>
<td>催化？ 再生</td>
<td>“Catalyst cleaning” followed by a wet chemical process to remove decay compounds plus re-impregnation of the catalytic compound(s).</td>
</tr>
<tr>
<td>Product</td>
<td>Rejuvenation Catalyst</td>
<td>催化？ 复原</td>
<td>“Catalyst cleaning” followed by a wet chemical process to remove some decay compounds with minimum removal of catalytic compound(s). There is no re-impregnation of the catalytic compound(s).</td>
</tr>
</tbody>
</table>
Identify every Demin user and supplier with corporate identifier

<table>
<thead>
<tr>
<th>Demin User/Supplier</th>
<th>Corporate Identifier</th>
<th>Company Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beijing Guodian Longyuan Environmental Engineering</td>
<td>1274</td>
<td>北京国电龙源环境工程有限公司</td>
</tr>
<tr>
<td>Beijing Guohua Renyuan Environmental Engineering</td>
<td>1275</td>
<td>北京国华荏原环境工程有限公司</td>
</tr>
<tr>
<td>Beijing Jingming Powder Metallurgy</td>
<td>754</td>
<td>北京精明粉末冶金有限公司</td>
</tr>
<tr>
<td>Beijing Longyuan Cooling Technology</td>
<td>2382</td>
<td>北京紫泉能源环境技术有限公司</td>
</tr>
<tr>
<td>Beijing Maoxiuxuri Environmental Filter</td>
<td>785</td>
<td>北京懋修旭日环保滤材有限公司</td>
</tr>
<tr>
<td>Beijing Origin Water Technology</td>
<td>3639</td>
<td>北京紫泉能源环境技术有限公司</td>
</tr>
<tr>
<td>Beijing Scinor Membrane Technology</td>
<td>3640</td>
<td>北京紫泉能源环境技术有限公司</td>
</tr>
<tr>
<td>Beijing Tri-High Membrane Technology Company</td>
<td>3641</td>
<td>北京紫泉能源环境技术有限公司</td>
</tr>
<tr>
<td>Beijing Ziquan Energy Environment Technology</td>
<td>1276</td>
<td>北京紫泉能源环境技术有限公司</td>
</tr>
</tbody>
</table>
Associations

• EPRI has continuing important efforts. The 1999 PWR Water Chemistry guidelines is a free download on their website [www.epri.com](http://www.epri.com).

• Water demineralizers by ion exchange is one of the VGB publications at [www.vgb.org](http://www.vgb.org).

• VGB’s annual Conference “Chemistry in Power Plants” was held last October in Leipzig.

• Western Turbine Users, 7F Users, Combined Cycle Users, D5-5A Users, Frame 6A users, 7EA users, ACC Users, 501F Users, 501 G users, Australian HRSG Users, HRSG Users.

• User group activities are well reported in CCJ.
Specialized Journals and conferences

- PPChem [www.ppchem.net](http://www.ppchem.net)
- 34th Annual Electric Utility Chemistry Workshop [www.conferences.uiuc.edu/eucw/](http://www.conferences.uiuc.edu/eucw/)
- 50 VGB Conference "Chemistry in Power Plants 2014" with ... [www.vgb.org › Events › VGB Events](http://www.vgb.org)
- Workshop - NPC 2014 SAPPORO Nuclear Plant Chemistry ... [https://www.npc2014.net/workshop.html](https://www.npc2014.net/workshop.html)
Using the Intelligence System

- **Product** Products are clearly defined
- **Process** processes are less important on this subsidiary site but very important on the main site
- **Corporations** So Hach would show under Danaher. You need to click on subsidiaries to see the same info under Hach
- **General Subjects** markets, maintenance etc
- **Locations** Countries ,states and cities
- **Applications** Sorted by NAICS code and Chinese descriptors
Other search tools

- **Global Search**  Search by any key word
- **Person**  Search by last name first
- **Subsidiary**  So Hach instead of Danaher
- **Format of Information**  presentations vs articles
- **Mcllvaine Keyword Search**  search by any text word in summary
- **Publication**  Search by publication name
- **Publication Date**
- **Title**  Very important because all articles are listed in chronological order and you can check for the latest inputs
- **Calendar of Events**
Critical measuring points (Hach)