

Water Sustainability in the Pulp & Paper Industry

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Workshop Overview

Industry Background:

The pulp and paper industry is among one the largest manufacturing sectors in 48 states. It is also one of the largest water users. However, nearly 88% of this water is treated and returned to the environment, greatly reducing the amount of consumed water. Nevertheless, there are expanding efforts to overcome water use challenges. These efforts include reducing the use of fresh water in the pulping and papermaking processes, developing technologies that treat and reuse process water, and developing closed-loop systems.

This initial event began to address some of these challenges and provided a better understanding of water issues in the pulp and paper sector as well as defined water sustainability initiatives in the industry.

Workshop Goal:

This was a 2 day intensive workshop featuring invited presentations focusing on water sustainability issues in the pulp and paper industry. The objective was to develop a more detailed best practices effort as the pulp and paper industry moves forward in reducing their water footprint and invests in expanding their water sustainability initiatives.

This Program Featured 4 Topical Sessions:

- External Pressures and Drivers
 - Global Competitiveness – countries with more lax environmental regulations
 - GHG Footprint – pressures from buyers like Walmart to reduce environmental footprint
 - Regulations on water use, contaminant levels
- Water Use Challenges
 - Reduce use of fresh water in the pulping and papermaking processes
 - Develop technologies that treat and reuse process water
 - Develop closed-loop systems
- New Technology Needs
 - Separation processes – membrane technologies, fast-acting systems, process modeling
 - Contaminant removal – trace metals in process waters, pulp fibers
 - Low-grade heat recovery from process water – separation out of contaminants, new technologies
 - Waste water treatment – technological advances
- Barriers to Development
 - Funding for R&D, pilot plant studies
 - Collaboration with membrane community
 - Greater understanding of process chemical transport and other phenomena

Summary - Session I: External Pressures and Drivers

Water is a much discussed subject in the social media as water consumption is becoming an increased concern in the public eye. Studies have shown that 90% out of 32,000 people in 15 countries deem water pollution a serious problem. The Pulp and Paper Industries is one of the top manufacturing sectors in the U.S. and currently ranks as the 4th largest water user. Many industries, government, and non-governmental agencies are taking action to address these concerns.

Following the presentations by Jerry Schwartz (AF&PA), Nicole Tanner (WWF/AWS), and Laura Thompson (SAPPI), a panel and floor discussion took place to determine the external pressures and drivers to water challenges, list the priorities, and suggest approaches to address these issues in the pulp and paper sector. Some of these drivers discussed include:

1. Regulatory Drivers

Regulations on water use could drive people to use less water. A specific example is the EPA Cooling Water Intake Structure (CWIS) Rule. This rule places a threshold on water use for companies that use below 2 million gallons per day. Below this line, there is no “large” environmental impact. The Great Lakes Regional Compact is another example of a local project that places certain limitations on businesses depending on the amount of water withdrawal.

2. Marketplace Drivers

There is an initiative by the Alliance for Water Stewardship (AWS) to develop a global water stewardship program that “recognizes and rewards water users and managers who take significant steps to minimize their water use and impact.” The AWS also created a global water roundtable that is making efforts to develop a water sustainability standard by July 2013. This serves as the basis for water certification.

Customer goals in the marketplace are also a huge driver. It was agreed that market perception is an essential part of getting companies to establish sustainability goals. The AF&PA is the only organization representing US manufacturers in any industry with such an extensive suite of quantifiable and verifiable sustainability goals. As an example, AF&PA was able to exceed goal expectations in reducing Greenhouse Gas emissions to 20% by 2012. AF&PA then moved to higher expectations, bumping the numeric goal to 15% more by 2020. Reviewing performance on a regular basis will greatly contribute to setting sensible numeric goals that make sense.

3. Climate Events (e.g. Drought)

There are always risks of climate variability. Mills need to ask themselves: are we in a sustainable area? What is the procedure during an occurrence?

4. SEC Guidance on Water for Disclosure (and for carbon)

5. Water Risks (e.g. physical, regulatory, environmental, financial, and reputational)

6. Energy Conservation

Water technologies are driven by energy projects. Water treatment processes and management come at an energy cost and may have a detrimental effect on energy conservation.

7. Competing Demands on Water

Businesses are acquiring permits and licenses for watershed privileges. Pulp and Paper industries are also situated where there is ample water supply. Pulp and paper mills pay for the cost of heating, pumping, and treating water but the overall cost of water is not well understood.

In the future, stakeholders with economic backgrounds may put a price on water to reduce water consumption.

8. Stakeholder Concerns

Companies respond to competition. It is essential that companies clearly define the scope and what they are comparing to when reporting data. These include questions such as what are the metrics? Why does it matter? How do we measure the water balances? Is it total water? If 88% of total water intake gets returned, what about the water in the wood? Are the numbers tied to sustainability when applying water footprint networking?

The next questions addressed the actions and responses needed to overcome these challenges, pressures, and drivers as previously discussed: The group agreed that a **clear set of definitions and metrics are needed**. Although a multitude of organizations are attempting to define these metrics, the problem arises when we end up with >50 different set of metrics. In this case, **what are the right metrics?** In Life Cycle Assessment (LCA), measurements are heavily dependent on the scope you are studying. Allocation of methods in LCA can also influence results, potentially driving false conclusions and bad decisions. Therefore, there is a strong need to **determine the key leading groups and come up with a standard**. In response, AIChE is currently making strong efforts to come up with a standard set of ~8 key metrics that will give about 80% accuracy. Awareness has even reached the Dow Jones Index, which has been revised to include a water component.

At the WWF, water efforts are working together to form a standard in preserving water sheds. This includes the CEO water mandate (CEOwatermandate.org). The first draft is expected to be out for review in March 2012.

Finally, we need to **look at the list of water projects and find common metrics**. This is one of the pilots for the pulp and paper industry.

Summary – Session II: Water Use Challenges

Session II opened with presentations from Barry Malmberg (NCASI) and Ron Brown (Agenda2020 Technology Alliance). The **takeaways and remaining water challenges in the pulp and paper industry** from this session include:

1. Lack of external driving forces (e.g. economic or regulatory)
2. Increased process control demands
3. Unknown water quality tolerances in operations
4. Too many complicated and undefined metrics
5. Standard definitions (water use – consumptive; discharge; process water, or process and cooling water)
6. Challenge to convey global message because localized issue
7. Difficult to convey perception of water use – what's good and what's bad
8. Putting the message into the watershed context
9. Habits (water has historically been plentiful)
10. Bias of machine operators against reuse due to past bad experience
11. Breakthrough for felt cleaning in press shower; consistent quality effluent for recycle use
12. Can the goals be met with existing vs. new technologies?
13. Variability in the age of equipment PM or pulp mill

Summary – Session III: New Technology Needs

Man-made and natural causes have been a strong driving factor to lower water consumption and water use around the world. In response, industries are striving to research and develop new technologies that will facilitate mill operations and help achieve these goals. Steven Hatch (Nalco), Vincent Caprio (Water Innovations Alliance), and Dr. Mrinal Mahapatro (Pall Corporation) discussed the developing technologies in the market today and the future technologies needed in water treatment processes.

The new technology needs include:

- Development of non-contact sensors that are antifouling
- Removal of sticky fibers from membranes for separation
- Potential applications for targeting water reuse.
- Water specifications for end-use applications
 - Examples: mechanical seals cooling, machine showers, nozzles
 - How much contaminant can a modern press felt take?
- Pulp washing at higher consistency
 - There is a need to improve mixing performance in both mechanical and non-mechanical mixers
 - Define the range/benchmark for washers
 - What are the specifications and summaries of the best washers that are available?
- Challenges in treatment of filtrate from initial Kraft bleaching stages
 - Low pH operations challenges and hot pH on peroxides
 - Filtration in corrosive environments
- Monitoring and controlling Save-All clear filtrate quality in order to reuse water
 - Challenges in identifying the right probes/sensors for that application
 - Need technologies to control dissolved and suspended solid levels
 - Some commercial sensors could cost around \$6k. Therefore, there is a need for antifouling sensors to keep costs low.
- New treatment and cleaning chemistries to improve throughput of membranes in waste treatment
 - What level of removal is required to make substantial improvement?
 - Again, water specifications are needed
- New technologies for tertiary treatment of waste effluent to supply water with acceptable quality for reuse (“treat to need”)
 - Capital expenses are high so there is a need to improving treatment costs
 - Tertiary treatment required due to low EPA levels
- Examine total costs optimizations (energy, water, and environmental costs)

Summary – Session IV: Barriers to Development

For the closing session, we opened the floor to discussion regarding all barriers to development of these new technologies.

It was agreed that the main barrier is **defining the specifications**. What are the specifications on water contaminants? What is the level we need to reach? What are the water operations specifications? How are mills reusing water? What types of failure mechanisms exist in water operations? **Conducting surveys** of the mills would be an initial approach to answering these questions.

Furthermore, **site testing is also needed for tertiary clean up technologies**. But, where can these tests be done? And how do we keep the costs down? There are barriers to advanced improvements since capital expense is a major issue and a great amount of equipment is involved.

So how do we overcome these barriers? The best solution is to reach **out to the “desperate groups” who have no fresh water available** (e.g. Israel, Singapore, etc.) and find out what they are doing. How are they setting and meeting their goals? By focusing on water-deprived regions, we can explore the options that exist.