It is an honor and privilege to serve you as President during the 2013 membership year! The AES is celebrating its 20th anniversary in 2013 and it is amazing to see the progress that we have made since the early years. I asked one of our founding members, Dr. Michael Timmons, to provide a brief history of the origin of the AES for this letter...”The Aquacultural Engineering Society was formed in 1993 - Can it be that long already? A group of us were sitting around at a World Aquaculture Society Meeting in 1993 in some exotic location, snacking away at one of the famous happy hours, and lamenting the fact that the engineers had no identity at these meetings. It was frustrating. We would sponsor a session and the room would be packed. People were desperately seeking engineering information as our industry was moving towards intensive culture systems. The engineers were always add-ons to someone else’s program or session. Finally, Dr. Jaw Kai Wang (University of Hawaii and AES’s second President) said, “we can do this!” We all immediately asked, “What, Jaw Kai?” Jaw Kai responded something along the lines of “…you crazy guys. Don’t you see? We need to form our OWN society.” That was pretty much how it happened. We quickly settled in on the name of the Aquacultural Engineering Society. We established some ground rules that the society should be international and that the executive officers should be engineers with at least one engineering degree on their resume. We pretty much self-selected a first executive committee from the folks sitting around the table and within a few months, we were a legally incorporated society and had a business checking account at the Cornell Federal Credit Union. Wow. We did it. And it didn’t require thousands of dollars and an infinite series of committee meetings. We just did it. That’s really what engineers do, isn’t it? We see a problem, and we fix it.”

Thanks to that group of founding members we have our own professional society that focuses on engineering issues in aquaculture. Our society is active thanks to the service of officers, directors and members since 1993 and continues to grow today. Just this past February the AES organized and sponsored four (!) sessions at World Aquaculture 2013 – Biofloc Systems, Applications of Biotechnology in Aquacultural Systems, Aquaculture Engineering and Engineered Aquaponics. We will also be organizing and moderating sessions on Land-Based Farming at Aquaculture Europe 2013. As you can appreciate from our varied session topics in 2013, our membership is diverse and active in many areas of aquaculture. As aquaculture grows to meet the needs of a hungry world our members are growing to meet the needs of aquaculture industry worldwide. It is an exciting time of growth for aquaculture and aquacultural engineering. I encourage you to become active in the AES if you are not already – your first step is to join or renew your membership in the AES. This is especially convenient using our new website – www.aesweb.org.

In closing I would like to thank Asbjorn Bergheim for his four years of service as an officer and thank Rafael Morey, Marc Verdegem and Greg Boardman for their most recent two years of service as directors of the society. And finally, we must thank Tim Pfeiffer for his six years of service as Secretary/Treasurer and Ed Aneshansley for taking the reigns from Tim to become our new Secretary/Treasurer. Thanks to all!

Best Regards,

Brian Vinci
Recirculating aquaculture systems, or RAS, are designed so that once water exits the culture tank it is renovated and recycled back. This allows fish to be raised in high density for efficient use of space; supporting more intensive culture than traditional methods (Timmons et al., 2001). Since RAS are designed to recycle as much water as possible, their filtration components are designed to generate low volumes of highly concentrated effluent. The effluent is easy to collect from multiple point sources and, although concentrated, provides greater potential for reducing nutrient pollution than traditional methods of culture (Piedrahita, 2003).

Proper management of these wastes is crucial because the solids contained in the effluent can have serious negative environmental impacts such as localized eutrophication (Smith et al, 1999), phytoplankton blooms, and fish kills (Jones and Preston, 1999). RAS wastes are comprised mostly from uneaten food and fecal matter (Losordo and Westers, 1994). The negative impacts of untreated RAS wastes stem from introducing a significant amount nitrogen, phosphorus, and suspended solids to local waters. With proper effluent management, local eutrophication can be avoided. One effluent management technique is to incorporate a geotextile bag (Geotube) filtration system to a new or existing RAS for solids removal. Geotextile bag systems mitigate discharge by consolidating the solid wastes, suspended particles, and reactive phosphorus in the effluent generated by system filtration (Ebeling et al. 2005). This project is using TenCate Geotube products for both the small-scale Geotubes, and the full-sized system (TenCate, 2011). These systems can also be used to help RAS facilities meet discharge limits set by NPDES permits.

A Geotube system is comprised of a large geotextile bag filter, through which effluent is filtered, preceded by a polymer injection loop. Just before the effluent stream enters the bag, it is dosed with chemical polymer to increase removal capability by binding of waste particles (Sharrer et al, 2009). Polymers assist in separating suspended particles from solution. Suspended particles, like fish wastes, are very small and remain suspended due to their size and electrical charge between them. Coagulants are used to neutralize the repulsive, typically negative charges, and aid in creating ‘flocs’. Flocculants facilitate the aggregation of ‘flocs’ by forming ‘larger flocs’ which accelerate gravitational settling (Water Specialists Technologies, 2013). Polymer optimization experiments are needed to determine the proper polymer type and dose in order to optimize ‘floc’ production. By optimizing the polymer effect, the system retains much of the solids; allowing cleaner, filtered water to be released.

Geotube systems have been established as an effective treatment option for freshwater RAS (Ebeling et al., 2005), but little has been published regarding the use of a Geotube system with marine
Recirculating aquaculture systems, or RAS, are designed so that once water exits the culture tank it is renovated and recycled back. This allows fish to be raised in high density for efficient use of space; supporting more intensive culture than traditional methods (Timmons et al., 2001). Since RAS are designed to recycle as much water as possible, their filtration components are designed to generate low volumes of highly concentrated effluent. The effluent is easy to collect from multiple point sources and, although concentrated, provides greater potential for reducing nutrient pollution than traditional methods of culture (Piedrahita, 2003).

Proper management of these wastes is crucial because the solids contained in the effluent can have serious negative environmental impacts such as localized eutrophication (Smith et al., 1999), phytoplankton blooms, and fish kills (Jones and Preston, 1999). RAS wastes are comprised mostly from uneaten food and fecal matter (Losordo and Westers, 1994). The negative impacts of untreated RAS wastes stem from introducing a significant amount nitrogen, phosphorus, and suspended solids to local waters. With proper effluent management, local eutrophication can be avoided. One effluent management technique is to incorporate a geotextile bag (Geotube) filtration system to a new or existing RAS for solids removal. Geotextile bag systems mitigate discharge by consolidating the solid wastes, suspended particles, and reactive phosphorus in the effluent generated by system filtration (Ebeling et al., 2005). This project is using TenCate Geotube products for both the small-scale Geotubes, and the full-sized system (TenCate, 2011). These systems can also be used to help RAS facilities meet discharge limits set by NPDES permits.

A Geotube system is comprised of a large geotextile bag filter, through which effluent is filtered, preceded by a polymer injection loop. Just before the effluent stream enters the bag, it is dosed with chemical polymer to increase removal capability by binding of waste particles (Sharrer et al, 2009). Polymers assist in separating suspended particles from solution. Suspended particles, like fish wastes, are very small and remain suspended due to their size and electrical charge between them. Coagulants are used to neutralize the repulsive, typically negative charges, and aid in creating ‘flocs’. Flocculants facilitate the aggregation of ‘flocs’ by forming ‘larger flocs’ which accelerate gravitational settling (Water Specialists Technologies, 2013). Polymer optimization experiments are needed to determine the proper polymer type and dose in order to optimize ‘floc’ production. By optimizing the polymer effect, the system retains much of the solids; allowing cleaner, filtered water to be released.

Geotube systems have been established as an effective treatment option for freshwater RAS (Ebeling et al., 2005), but little has been published regarding the use of a Geotube system with marine RAS. This project is focused on finding a practical, effective method of incorporating a Geotube system to an existing marine RAS.

The objective of these experiments was to evaluate the effectiveness of seven, commercially-available chemical polymers for removing wastes from effluent of a marine RAS growing black sea bass. The chosen polymers are generally regarded as safe (GRAS) and were tested for reactivity to marine effluent by a series of Jar test experiments. The first experiment (Expt. 1) conducted was a polymer screening of seven polymers across a wide range of doses to determine their reactivity to marine RAS effluent. The second experiment (Expt. 2) served as a dose optimization study for the polymers found to be most reactive in Expt. 1.

The experiments were conducted at the University of North Carolina at Wilmington: Center for Marine Science Aquaculture Facility (Wrightsville Beach, North Carolina). Seawater is supplied
For this experiment, all seven polymers were tested at 0, 1, 5, 10, 15, 20, 25, 30, 35, 40, 45, and 50-ppm to look for any reactivity to the effluent including ‘floc’ formation and separation. Each dose was tested in duplicate. After the jar test was completed, samples were taken from the sampling ports and measured for Turbidity using a Hach Turbidity meter. The nature of solids coagulation, including density, shape, adhesion, and water clarity improvement, was also used to judge polymer effectiveness. Polymers selected for Experiment 2 were reactive at a safe dose of <20-ppm, as suggested in MSDS (Hychem, Florida, US). In practice, it is important to use the lowest dose possible to minimize the potential of environmental interaction.

To quantify the polymer’s effect at removing solids from the effluent, the difference in turbidity levels between the control and treated effluent was expressed as a percentage of the untreated control (in which, no polymer effects would be seen). Solids removal efficiency (SRE, %) was calculated as the difference in concentration of pollutants (TSS) in the supernatant between the control (C) and treatment (T).

\[
\text{SRE} = \left(\frac{[\text{C}] - [\text{T}]}{[\text{C}]}\right) \times 100
\]

### Polymer Screening Results

Figure 1 shows the SRE for all 7 polymers over the range of doses tested. It is clear that some polymers showed high reactivity, while others did not. Polymers that showed a peak in SRE at or under 20-ppm with well-defined floc formation were chosen for dose optimization experiments. DF 2468, DF 2449, HF CE 854, and HF CE 1950 exhibited high SRE at low doses, dense floc formation (Figure 2).

HF CE 809 showed a moderate SRE of 36% at lower doses, but this polymer did not cause clumping of wastes, which is key to retention of solids within the Geotube. This polymer was not chosen for further testing.

MF E 30 showed a peak SRE of 31% and showed no floc formation across the entire range of doses, so it was also omitted from further investigation.

MF E 38 showed a peak SRE of 10% and declined at higher doses. The negative SRE values indicate that the polymer had a dispersant effect on the solids, actually making the water more turbid than the untreated control. This polymer was excluded from further investigation.

Figure 2 shows the 4 polymers chosen for dose optimization based on the results of experiment 1.

Drewfloc 2468 showed a maximum SRE of 65% at 5-ppm, and substantial floc formation from (5-15)-ppm.

**Dose Optimization: Experiment 2**

The dose optimization study looked more closely at the chosen polymers than the polymer screening. These jar tests looked at each polymer within the three doses that appeared to respond best to marine RAS effluent and ranged between 5 and 20-ppm. Each dose was tested in triplicate, including the untreated control. To quantify removal of solids in Expt. 2, SRE of TSS was used to increase the accuracy and precision of my measurements. Using this method of analysis also allowed me to create filtered samples to use for dissolved nutrient analyses.

In Expt. 2, three doses for each polymer were chosen to bracket the apparent optimum SRE, and are indicated by the enlarged markers. Although SRE was a primary criterion for polymer effectiveness, the floc density and “stickiness” were also considered.

**Dose Optimization: Results**

Figure 3 shows the SRE of TSS for selected polymers within their apparent optimum dose range. The effects of polymer type were clearly apparent and statistically significant.

DF 2468 had the highest solids removal efficiency of 85%. We observed a significant dose effect within DF 2468, with its highest SRE at low and mid dose. High SRE, in addition to ideal floc formation made this polymer an excellent candidate for pilot testing.

DF 2449 had the second highest overall SRE of 75% at the 10-ppm dose. There was not a significant dose effect within this polymer, and it is also a very good candidate for further pilot testing.

HF CE 854 did not show a SRE similar to Expt. 1, and SRE was poor to negative at its higher doses. The cause for the lower efficiency across all doses is unknown, and this polymer was not a good candidate for further testing. It is possible the
composition of effluent between experiments 1 and 2 affected its coagulation properties, although attempts to maintain consistency were made. HF CE 1950 at its low dose showed moderate SRE. At higher doses, we observed poor to negative SRE. It was deemed un-suitable for further evaluation.

Conclusions:
From experiment 1, we saw that only 4 out 7 polymers reacted to our marine effluent across a broad range of doses which exceeded practical usage levels. This indicates that effluents need to be screened and polymer additions need to be optimized for individual systems. Experiment 2 showed us that polymer type had highly varied effects on solids coagulation in marine RAS wastes, and that these screenings are critical to maximizing the efficiency of Geotube systems. Polymer dose also affected coagulation efficiency. Even polymers that respond well can reach an overdose level, causing an ionization shift, and re-stabilization of solids. This effect was seen as negative SRE values in Hyperfloc polymers at 20 ppm (Fig. 3). Finding a polymer that is effective over a wide dose range, even with lower SRE values, can prove a more efficient option for Geotube application than another polymer with higher SRE values over a narrow dose range. The results of this study indicate that the chosen Hyperfloc and Magnafloc polymers found to be effective in treating freshwater RAS effluent were not as efficient in our marine application. Our results imply that salinity markedly affect’s a polymer’s capability to bind wastes. Based on the results of these experiments, DF 2468 at 5-ppm was chosen for further testing based on its high SRE, and floc formation at low doses. DF 2449 at 10-ppm was also chosen for further investigation due to its high SRE, floc formation, and ability to perform across a broad range of doses. These two polymers were chosen for Geotube Dewatering tests (GDT) that are nearing completion. The mini-Geotube tests are serving as a scale-up of these laboratory results, and allow small-scale testing before a final polymer is chosen for application to a full-scale marine Geotube system.

Acknowledgements:
We thank MARBIONC (Marine Biotechnology in North Carolina) for funding support, Ashland Hercules Water Technologies, Hychem, and BASF for providing polymers, Rachel Huie (NCSU) for providing a Jar Tester for laboratory experiments, and TenCate for GDT bags.

References:
Just released in April 2013

“Biofloc Production Systems for Aquaculture” is a publication provided through the Southern Regional Aquaculture Center (SRAC) and authored by Dr. John Hargreaves. This document offers a review of biofloc technology from a unique perspective and provides practical insights into the inner-workings of biofloc systems. The publication will give newcomers to biofloc technology a solid background on the topic and will provoke new ideas in the minds of the most seasoned veterans.

The paper is available for free at this link:
https://srac.tamu.edu/index.cfm/event/getFactSheet/whichfactsheet/259/

**AES Awards Summary - 2012**

**SUPERIOR PAPER AWARD**

Jan P. Schröder, Peter L. Croot, Burkhard von Dewitz, Uwe Waller and Reinhold Hanel

“Potential and limitation of ozone for the removal of ammonia, nitrate, and yellow substances in marine recirculating aquaculture systems”

**HONORABLE MENTION PAPER AWARDS:**

Ido Seginer and Raz Ben-Asher

“Optimal harvest size in aquaculture, with RAS cultured sea bream (Sparus aurata) as an example”
Aquacultural Engineering, Volume 44, Issue 1, 2011, pp. 55-64.

Tae Ho Kim, Kyong Uk Yang, Kyu Serk Hwang, Duck Jong Jang and Jung Gyu Hur

“Automatic submerging and surfacing performances of model submersible fish cage system operated by air control”
Aquacultural Engineering, Volume 45, Issue 1, 2011, pp. 74-86.
SECOND ANNOUNCEMENT!
Welcome to the 2nd RAS workshop organized by the Nordic Network on Recirculating Aquaculture Systems (NordicRAS.net).

The workshop will address current & coming challenges for development of RAS, with particular focus on operational applicability and environmental sustainability.

Topics List
- Feed and waste characterization
- Water quality
- Microbiology & biofiltration
- Harmful substances
- End-of-pipe treatment
- Energy optimization

Registration
Register now at www.NordicRAS.net
Only 200 seats available!

Abstracts
Submission deadline Monday 3rd June 2013

Keynotes
- Opening: Prof. Johan Verreth
- Opening: Dr. Niels Alsted
- Session 1: Prof. Per Halkjær Nielsen
- Session 2: Prof. Lone Gram
- Session 3: Prof. Ori Lahav
- Session 4: Dr. John Colt

Organizers
NordicRAS

Papers from the first workshop on recirculating aquaculture systems, recently published as Volume 53 in Aquacultural Engineering:

- Farming different species in RAS Nordic countries: Current status and future perspectives (Dalsgaard, et al.)
- Commercial land-based farming of European lobster in recirculating aquaculture system (RAS) using a single cage approach (Drengstig, et al.)
- Feed and treat: What to expect from commercial diets (Unger & Brinker)
- Insight into bacterial population in aquaculture systems and its implication (Blancheton et al.)
- Long-term carbon dioxide experiments with salmonids (Fivelstad)
- Waste treatment in recirculating aquaculture systems (van Rijn)
- End-of-pipe denitrification using RAS effluent waste streams: Effect of C/N-ratio and hydraulic retention time (Suhr, et al.)
- Peracetic acid degradation in freshwater aquaculture systems and possible practical implications (Pedersen, et al.)

BOD - CONTACT INFO

<table>
<thead>
<tr>
<th>Name</th>
<th>City, State Country</th>
<th>Position</th>
<th>Term</th>
<th>Engineering Status</th>
<th>E-mail address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ed Aneshanesly</td>
<td>Beverly, MA</td>
<td>Past President</td>
<td>2010-2013</td>
<td>ENGR</td>
<td><a href="mailto:eda@aquaticcco.com">eda@aquaticcco.com</a></td>
</tr>
<tr>
<td>Brian Vinci</td>
<td>Shepherdstown, WV</td>
<td>President</td>
<td>2011-2014</td>
<td>ENGR</td>
<td><a href="mailto:b.vinci@freshwaterinstitute.org">b.vinci@freshwaterinstitute.org</a></td>
</tr>
<tr>
<td>Ying Liu</td>
<td>Qingdao, China</td>
<td>1st Vice-President</td>
<td>2012-2015</td>
<td>INT-ENGR</td>
<td><a href="mailto:yinliu@qdio.ac.cn">yinliu@qdio.ac.cn</a></td>
</tr>
<tr>
<td>David Kuhn</td>
<td>Blacksburg, VA</td>
<td>2nd Vice-President</td>
<td>2013-2016</td>
<td>ENGR</td>
<td><a href="mailto:davekuhn@vt.edu">davekuhn@vt.edu</a></td>
</tr>
<tr>
<td>Ed Aneshanesly</td>
<td>Beverly, MA</td>
<td>Secretary/Treasurer</td>
<td>2013</td>
<td>ENGR</td>
<td><a href="mailto:eda@aquaticcco.com">eda@aquaticcco.com</a></td>
</tr>
<tr>
<td>German Merino</td>
<td>Chile</td>
<td>Director</td>
<td>2012-2013</td>
<td>INT-ENGR</td>
<td><a href="mailto:gmerino@ucn.cl">gmerino@ucn.cl</a></td>
</tr>
<tr>
<td>Anne Johanne Tang Dalsgaard</td>
<td>Denmark</td>
<td>Director</td>
<td>2012-2013</td>
<td>INT-ENGR</td>
<td><a href="mailto:jtd@aqudt.dk">jtd@aqudt.dk</a></td>
</tr>
<tr>
<td>David Brune</td>
<td>USA</td>
<td>Director</td>
<td>2012-2013</td>
<td>ENGR</td>
<td><a href="mailto:bruned@missouri.edu">bruned@missouri.edu</a></td>
</tr>
<tr>
<td>Raul Piedrahita</td>
<td>Davis, CA</td>
<td>Director</td>
<td>2012-2013</td>
<td>ENGR</td>
<td><a href="mailto:rhpiedrahita@ucdavis.edu">rhpiedrahita@ucdavis.edu</a></td>
</tr>
<tr>
<td>John Davidson</td>
<td>Shepherdstown, WV</td>
<td>Director</td>
<td>2013-2014</td>
<td>NON-ENGR</td>
<td><a href="mailto:j.davidson@freshwaterinstitute.org">j.davidson@freshwaterinstitute.org</a></td>
</tr>
<tr>
<td>Bendik Fynh Terjesen</td>
<td>Norway</td>
<td>Director</td>
<td>2013-2014</td>
<td>NON-ENGR</td>
<td><a href="mailto:bendik.terjesen@nofima.no">bendik.terjesen@nofima.no</a></td>
</tr>
<tr>
<td>Noam Mozes</td>
<td>Israel</td>
<td>Director</td>
<td>2013-2014</td>
<td>INT-ENGR</td>
<td><a href="mailto:mozes@ocean.org.il">mozes@ocean.org.il</a></td>
</tr>
<tr>
<td>Kelly A. Rusch</td>
<td>Baton Rouge, LA</td>
<td>Director</td>
<td>2013-2014</td>
<td>ENGR</td>
<td><a href="mailto:krusch@lsu.edu">krusch@lsu.edu</a></td>
</tr>
</tbody>
</table>
AES President (USA)

Brian J. Vinci, PhD, P.E.
Brian J. Vinci, Ph.D., P.E., is the Director of Engineering Services for the Freshwater Institute, a field office and program of The Conservation Fund, Arlington, VA. Dr. Vinci earned his Bachelors and Masters degree in Agricultural and Biological Engineering from Cornell University and earned his Ph.D. in Biological and Environmental Engineering from Cornell. Dr. Vinci leads engineering projects in the areas of fisheries bioengineering, environmental engineering, and facility/infrastructure planning. Dr. Vinci is a licensed professional engineer (environmental) in New York and Pennsylvania.

AES First Vice President (China)

Ying Liu, PhD.
Dr. Ying Liu, is currently the Professor of the Institute of Oceanology, Chinese Academy of Sciences (IOCAS) and the vice director of R&D Center of Marine Environmental Engineering & Technology. He has also served as the Director of Branch Society of Aquacultural Engineering, Chinese Society of Agricultural Engineering (CSAE). Dr. Liu has been involved in aquacultural engineering research and education since 1994. Dr. Liu received a B.S. in Agricultural Architecture from North-west A&F University (China), a M.S. and Ph.D. in Biosystem Engineering from Zhejiang University (ZJU). Being the Professor of IOCAS, his research focuses on recirculating aquaculture system design. In this post, he is responsible for design and use of recirculating aquaculture systems.

AES Second Vice President (USA)

David Kuhn, PhD.
Dr. David D. Kuhn, Assistant Professor, joined the Department of Food Science and Technology faculty at Virginia Tech after receiving his doctorate, Ph.D., in Civil and Environmental Engineering at Virginia Tech in 2008. He also holds a B.S. degree in Mathematics (Saint Lawrence University), B.S. degree in Civil Engineering (Clarkson University), and a M.S. in Civil and Environmental Engineering (Clarkson University). In his short time as a faculty member he has helped bring in extramural funds to the University to work on various aquaculture projects that serve the needs of the aquaculture industry. To date, he has over 30 publications (18 peer-reviewed scientific manuscripts in press/published and 2 book chapters) and has presented more than 40 papers at various national/international meetings. His research interests include animal husbandry, alternative ingredients for aquaculture feeds, new species culture in recirculating aquaculture systems, seafood quality, systems engineering, toxicology, and waste handling/reuse. Overall, he enjoys working with industry to help them become more economically and environmentally sustainable.

AES Past President & AES Secretary/Treasurer (USA)

Edward D. Aneshansley, MPS, P.E.
Ed Aneshansley is currently a Senior System Engineer for the Waterlife Design Group, a division of Aquatic Habitats Inc. Mr. Aneshansley received his Bachelor of Science from the University of Maine, Orono, with a major in Natural Resources and a concentration in Marine Resources. Aneshansley received his Masters of Professional Studies (MPS) as a Sea Grant Scholar from Cornell University in the Department of Agriculture and Biological Engineering. He has been working the in private sector since 1999 in markets that require recirculating aquatic holding systems. These markets include: commercial aquaculture, live seafood distribution, biomedical research, marine mammal rehabilitation, public aquaria and education. He is a Professional Engineer (Environmental) registered in the state of Massachusetts where he currently resides.

AES Director (Chile)

German Merino, PhD.
He has a professional title as Aquacultural Engineer from Universidad Catolica del Norte (1994, Chile) and a PhD in Biological and Agricultural Engineering from University of California Davis (2004, USA). Dr Merino work as a professor of the Aquacultural Department at the Universidad Catolica del Norte, Chile. Dr Merino became involved in aquacultural activities back in 1992, accumulating experience in aquaculture facility operations, design and construction management with an emphasis on marine animals. Dr. Merino has worked with shellfish, flatfish, finfish, seaweeds, algae, rotifers under intensive culture systems, from which 15 papers have been published during the last 5 years. His recent projects include direction and participation as an aquaculture expert in the design of recirculation seawater aquaculture systems for mollusks such as abalone and scallops and marine finfish. He has been an AES member since 1996 and participated with oral presentations, session chair and workshop speaker at several Aquacultural Conferences counting more than 40 presentations in the last 5 years. Dr Merino has served the Aquacultural Engineering Society as BOD member for first time in 1998 and again in 2004 as well as Officer between 2008 and 2011 and therefore performed as AES President during year 2010. Recently took respons-

AES Director (Denmark)

Anne Johanne Dalsgaard, Ph.D.
Dr. Anne Johanne Dalsgaard is a Senior Research Scientist at the Technical University of Denmark, National Institute of Aquatic Resources (DTU Aqua), Section for Aquaculture. She received a B.Sc. and Ph.D. from the Faculty of Science at the University of Copenhagen (Denmark), and a M.Sc. in Resource Management and Environmental Studies from the University of British Columbia (Canada). Dr. Dalsgaard is organizer of the Nordic Network on Recirculating Aquaculture Systems (www.NordicRAS.net). Her research focuses on water quality and the coupling between fish feed utilization and waste nutrient composition and form.
AES Director (USA)

David Brune, Ph.D., P.E.

David Brune received his B.S. and M.S. in Agricultural Engineering and PhD in Sanitary Engineering from the University of Missouri-Columbia. A major focus of his research has been directed at quantifying, modeling, and optimizing the role of photosynthesis in existing and emerging aquacultural practices. His R&D activities at Clemson University in South Carolina resulted in the U.S. patented, “Partitioned Aquaculture System” and “Controlled Eutrophication Process.” Currently, at the University of Missouri, he leads research and extension efforts targeting deployment of integrated aquaculture / algal culture systems supporting co-production of bioenergy with environmental protection and remediation. He is a founding member and past president of the Aquacultural Engineering Society.

AES Director (USA)

Raul H. Piedrahita, Ph.D.

Dr. Raul H. Piedrahita is professor and department chair in the department of Biological and Agricultural Engineering at the University of California, Davis, where he has been on the faculty since 1984. Dr. Piedrahita’s research interests are in the area of water quality and treatment in aquaculture: theory and practice of CO2 measurement and control, suspended solids characterization and control, biofiltration, and computer modeling of unit operations and systems. He is a founding member and past president of the Aquacultural Engineering Society.

AES Director (USA)

John Davidson

John Davidson is as a Senior Research Associate at the Conservation Fund’s Freshwater Institute in West Virginia, where he has worked for 15 years. He earned a M.S. in Wildlife and Fisheries Resources from West Virginia University and a B.S. in Biology from Shepherd College. He has conducted a wide range of aquaculture research projects encompassing topics such as: evaluation of RAS unit process efficiencies, assessment of the effects of various water quality parameters on salmonid performance within RAS; and evaluation of alternative protein diets on water quality and fish performance within RAS. John manages and operates recirculating aquaculture systems and provides practical consulting support for the Engineering Services team at the Conservation Fund’s Freshwater Institute. John is the author of 16 peer-reviewed articles, many of which have appeared in Aquacultural Engineering journals.

AES Director (Norway)

Bendik Fyhn Terjesen, Dr. Scient.

Bendik Fyhn Terjesen is a senior research scientist at Nofima, Sunndalsøra, Norway. His research focuses on the physiological and nutritional requirements of Atlantic salmon in closed-containment systems, such as RAS. He was educated at Ålesund University College and University of Bergen, Norway (B.Sc., M.Sc.). He obtained Dr. scient. in environmental physiology in 2001, also at University of Bergen. He then joined Nofima as a research scientist, and since 2007 as a senior scientist. Dr. Terjesen did a post-doc at The Ohio State University in 2003-04, working on fish nitrogen metabolism and nutrition. In Nofima, he led the establishment of Nofima Centre for Recirculation in Aquaculture, and also managed the Research Council of Norway (RCN) project “Fish welfare and performance in recirculating aquaculture systems”. Currently he is the technical project leader of the RCN project “Optimized postsmolt production”, focusing on the requirements of Atlantic salmon postsmolts in RAS or in sea-based closed-containment systems. He also leads the work-package “Upscaling and validity of research results” in the EU project AquaExcel "Aquaculture Infrastructures for Excellence in European Fish Research".

AES Director (Israel)

Noam Mozes

Noam Mozes got his first degree in agronomy and in soil and water sciences at the Hebrew University in Rehovot. He got a M.Sc. degree as well as an engineering diploma at the Technion in Israel (1991). Noam Mozes established the aquaculture engineering research department at the National Center for Mariculture (NCM), IQLR, Eilat and conducted R&D projects for sixteen years, focusing on recirculating and integrated systems. He developed the low head RAS concept and together with the private sector developed the Mega-Flow recirculating system. This concept was scaled up into a commercial 100-ton pilot plant that was constructed under his supervision and management. At 2007 Noam was nominated as the head of the Mariculture division at the Fisheries and Aquaculture Department at the Ministry of Agriculture. He has concentrated and analysed all the technical and economical information on several RAS pilot projects in Israel. In addition, he is promoting off shore cage farming on the Mediterranean coast of Israel. He is strongly connected to the NCM and leading research projects on wastewater treatment and on the culture of groupers and other marine species.

AES Director (USA)

Kelly A. Rusch, Ph.D., P.E.

Dr. Kelly Rusch is the Formosa Plastics Endowed Professor in Civil and Environmental Engineering and the Dow Chemical Distinguished Professor for Engineering Diversity in the College of Engineering at Louisiana State University (LSU). Kelly received her Bachelor of Science from the University of Wisconsin-LaCrosse, majoring in Biology and Chemistry. She received her Master’s and Doctorate in Civil Engineering from Louisiana State University. Kelly has been on the faculty at LSU since 1993, and has a long-standing research career in the area of base of the food chain production technology (microalgae and zooplankton) development. Dr. Rusch is a past president of the Aquacultural Engineering Society.

www.aesweb.org
AES Member Registration

Name ___________________________________________________________________________
Company ____________________________________________________________________
Street Address _______________________________________________________________________________________________________________________________________________________
City _______________________________________________________________ State ______________ Postal Code __________________ Country _________________________________
Phone __________________________________________________________________________________ Fax __________________________________________________________________________
Email ___________________________________________________________________________________

2013 Annual Membership. Includes:
- One year subscription to the AES quarterly newsletter AES News (Volume 16)
- AES Member Directory for 2013
2013 Student Membership. Includes the same as above
2013 Sponsor (membership, printed journal subscription, advertising in newsletter/website, and one annual flyer mail out with newsletter) (www.aesweb.org)

Options (additional cost to the $30 annual membership dues):
- Print subscription to Elsevier’s journal Aquacultural Engineering (Volumes 52 - 57).
  - Standard one year subscription of the print journal
- Online subscription to Elsevier’s journal Aquacultural Engineering (Volumes 52 - 57).

Total ________

PAYMENT
- Check enclosed (Made payable to Aquacultural Engineering Society in US Funds)
- Charge: ☐ Visa ☐ MasterCard ☐ American Express ☐ Discover

Credit Card #: ___________________________ Expiration Date: ___________________ Security # (3-4digits): ___________________
Name on Card: __________________________________________________________ Signature: ________________________________________

Please send this form and payment to: Aquacultural Engineering Society, Terry Rakestraw, 8969 Mountain View Drive, Copper Hill, VA 24079 USA