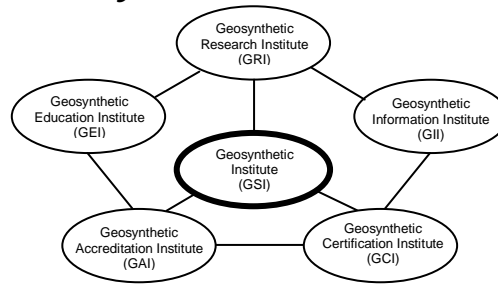


The GSI Newsletter/Report

Geosynthetic Institute



Vol. 24, No. 3

September 2010

This quarterly newsletter, now in its 24th year, presents the activities of GSI and its related institutes to all who are interested. It is available on the institute's home page at www.geosynthetic-institute.org. It also serves as a quarterly report to its member organizations. Details are available by contacting Robert M. Koerner or Marilyn Ashley at phone (610) 522-8440; fax (610) 522-8441 or e-mail at robert.koerner@coe.drexel.edu or mvashtley@verizon.net.

e-mail: oliveirapaul@firestonebp.com

Activities of GSI's Directors and Board of Directors

1. Of the ca. 100 power point presentations that we have, the most widely requested are those on failures. In particular, geotextile filter failures, landfill failures, veneer slope failures, and (most recently) MSE wall failures. Several workshops have been built around these presentations and if you have needs please communicate them accordingly.
2. The GRI-24 Conference on "Optimizing Sustainability Using Geosynthetics" is set for March 16, 2011 in Dallas, Texas. The tentative program has 21-papers/speakers and looks very interesting. We will have our annual and BoD meetings at the same time and location. See our Website under "Meetings" for information.
3. The coal combustion waste (CCW) issue is at the cusp of being finalized. GSI has "weigh-in" on the U.S. EPA open forum review period. The present (and unsettled) status is in this Newsletter/Report under "Items of Interest".
4. Equally significant as far as geosynthetics is concerned are frac-water ponds and solid waste disposal from natural gas drilling activities. The Marcellus Shale formation is of paramount importance.
5. Elections for three GSI Board members (agency, resin, intl.-1) will commence in later Fall. The present BoD is as follows:

Term Ends 2010

- David Jaros - Corps of Engineers (Government Agencies)
e-mail: dave.l.jaros@usace.army.mil
- Paul Oliveira - Firestone bp Inc. (Resin Producers)

- Kent von Maubeuge - NAUE GmbH & Co. KG (International-1)

e-mail: kvmaubeuge@naue.com

Term Ends 2011

- Dick Stulgis - GeoTesting Express (Consultants and Testing Laboratories)
e-mail: rstulgis@geocomp.com
- Gary Kolbasuk - Raven (Geomembranes and GCLs)
e-mail: gary.kolbasuk@ravenind.com
- Wayne Hsieh - GSI-Taiwan (International-2)
e-mail: cwh@mail.npust.edu.tw

Term Ends 2012

- Tony Eith (Chairman) - Waste Management Inc. (Owners and Operators)
e-mail: aeith@wm.com
- Boyd Ramsey - GSE Lining Technology, Inc. (Geotextiles and Geogrids)
e-mail: bramsey@gseworld.com
- Sam Allen - TRI/Environmental, Inc. (At-Large)
e-mail: Sallen@tri-env.com

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Overview of GRI Projects (Research)

Each issue of our Newsletter/Report provides a brief glimpse and update of current GRI research projects. It will be noted that most projects are of a very long duration. (In this regard short projects are given to design firms or testing laboratories that are GSI Members). Details and full briefings are available to member organizations at their request. Dr. Grace Hsuan, Associate Director of GRI can be contacted for additional information as can the other project managers listed in the following write-ups. **Projects marked with an asterisk have been written up as either short "in-progress" papers or complete papers.** Grace can be reached by phone at (610) 522-8440 or e-mail at <grace.hsuan@coe.drexel.edu>.

Important Notice: Use of GSI/GRI generated data and information is for member organization use assuming that the information is not taken out of the context of which it was developed. When used for formal publications such as proposals, regulatory permits, brochures and advertisements we would appreciate seeing a draft copy for possible comments. Thank you in this regard.

1. **In-Situ Temperature Monitoring of Liner and Cover Geomembranes in Dry and Wet Landfills*** - George Koerner is measuring the in-situ temperature behavior of liner and cover geomembranes and has installed 60± thermocouples for long term measurements in both wet and dry municipal solid waste landfills in Pennsylvania. The project has been extended into its 14th-year and has resulted in an extremely authoritative set of real-life data.
 2. **Bioreactor (aka, Wet) Landfill Behavior and Properties*** - One of the landfill cells mentioned in Item #1 is at field capacity, hence it is a true anaerobic bioreactor. Dr. George Koerner is in charge of considerable monitoring at this cell which includes the following
 - waste moisture content
 - waste temperature
 - leachate chemical analysis
 - waste gas analysis
 - perched leachate within the waste
- Data is being collected on a monthly basis. The timeline of the project calls for monitoring up to 10 years. This activity has been extended to an adjacent landfill to see how reproducible the data is with a slightly different waste mass.
3. **Flow Behavior of Fully Degraded Waste*** - A field project under sponsorship of GSI and Waste Management investigates the drainage of

highly degraded MSW placed directly on leachate collection systems. The leachate collection systems consist of both natural soils and geosynthetic drains. The project is now in its third year and is at a landfill in the Philadelphia area.

4. **UV Exposure of Geomembranes*** - GSI is using UV-fluorescent devices to estimate the projected exposed lifetime of many different types of geomembranes. Presently being incubated are HDPE, LLDPE, fPP, PVC (N.A.), EPDM, PE-R, fPP-R, and LLDPE-R. Exposure times of 40,000 light hours are now realized at 70°C and a replicate set of samples are now being incubated at 60°C. Some will take at least 60,000 light hours (≈ 8-years). The third sequence at 80°C was just started on 1/1/2010. Ongoing data is being reported to manufacturers and resin producers.
5. **Exposed Lifetime of PVC Geomembranes** - Of late, we have been attempting to distinguish between PVC geomembranes manufactured in North America versus Europe. Of course, the difference is in the type of plasticizers used in the formulations. In this regard we have been evaluating various European formulations for four years and the results are very impressive. The studies are for a GSI member organization.
6. **UV Exposure of Geogrids** - The UV-fluorescent exposure of four different biaxial geogrids which are used at the exposed surfaces of welded wire mesh retaining walls is ongoing. The various geogrids are now up to 30,000 light hours and data is being generated and sent to the respective manufacturers. As with the geomembranes, replicate samples will now be incubated at 60°C for eventual use in Arrhenius Modeling and lifetime prediction. The last set at 80°C has just begun incubation.
7. **UV Exposure of TRM Fibers** - We are also using UV-fluorescent exposure of several turf reinforcement mat fibers to assess their lifetime capabilities. They are presently being incubated at 70°C and 80°C. Communication between manufacturers is ongoing.
8. **UV Exposure of Repair Tape** - We have found that a particular type of polyethylene repair tape has been successfully used to repair an exposed geomembrane at a Delaware landfill. After five-years it appears very durable. Original samples are being evaluated in one of our fluorescent tube devices per ASTM D7238 at 70°C. Interestingly, we have just learned that seagulls like to pull the tape off of the geomembranes. We don't know how to simulate this particular mechanism!
9. **Field Behavior of fPP and fPP-R Geomembranes** - We continue to receive and evaluate field problems of flexible polypropylene geomembranes (mainly scrim reinforced). They

are regularly added to our database in this regard. The most recent was for potable water storage and had a service lifetime of 10-years. Using our correlation factor of 1200 light hours in D7238 at 70°C being equivalent to one-year in a hot climate, this is equivalent to a laboratory exposure in the weathering device of 12,000 light hours. Our GRI-GM18 specification calls for 20,000 light hours for a acceptable formulation.

10. **Retaining Wall Failure Evaluation** - We currently have GRI Reports 38, 39, and 40 addressing mechanical stabilized earth (MSE) walls using geosynthetic reinforcement which document 82-failures. They are either excessive deformation or collapses. A focus group committee on the topic will probably be reactivated (it has been dormant since 2000), to address what GSI can do to mitigate and improve this very serious situation. Contact Bob Koerner in this regard.
11. **pH Between Masonry Block Wall Units*** - George Koerner has been measuring the pH between three types of masonry blocks over four years to monitor the values. Concern here is over PET geogrids which can be sensitive to high alkalinity environments. The values started high, but over time are now down to eight and lower. George Koerner has a paper in this regard.
12. **Geomembranes to Resist Hydrocarbon Diffusion** - Concern over the diffusion of hydrocarbons is sometimes expressed and George Koerner has a relatively large scale experiment ongoing. Two LLDPE pouches measuring 1.5 × 2.0 m in size (one standard and the other EVOH) are presently under evaluation. Early results indicate the EVOH geomembrane is very effective in this regard,.. more later.
13. **Generic Specifications** - A major effort is ongoing with respect to the development and maintenance of generic geosynthetic specifications. The current status of these specifications is as follows:

Completed and Regularly Updated

- GM13 – HDPE Geomembranes
- GM17 – LLDPE Geomembranes
- GM18 – fPP Geomembranes
- GM21 – EPDM Geomembranes
- GM22 – Exposed Temporary Covers
- GM25 – LLDPE-R Geomembranes
- GM19 – Geomembrane Seams
- GT10 – Geotextile Tubes
- GT12 – Geotextile Cushions
- GT13 – Geotextile Separators
- GCL3 – Geosynthetic Clay Liners

Working Within Focus Groups

GCXX – TRMs for Erosion Control
 GTXX – High Strength Reinforcement Geotextiles
Delayed or Off in the Distance

GGXX – Bidirectional Geogrids
 GGXX – Unidirectional Geogrids
 GNXX – Geonet Drainage Composites
 GCXX – Other Drainage Geocomposites

The complete specifications are available to everyone (members and nonmembers) on the open section of our Home Page. Please download and use them accordingly. Also note that this is where the latest modification will always be available. Copies of the above listed draft specification tables are also available to members and associate members.

14. **Other GRI Standards** - There are several GRI Standards in various forms of preparation. One involves spray-on geomembranes and the other vapor barriers. Contact George Koerner for the status of these efforts.

Activities within GII (Information)

Our GSI Home Page and is accessed as follows:

<<<http://www.geosynthetic-institute.org>>>

It has been completely revised and is being maintained through the fine efforts of Marilyn Ashley. Everyone (members and nonmembers) can access the open part, which has the following menu:

- | | |
|-----------------------------------|----------------------------|
| • Introduction to GSI | • Laboratory Accreditation |
| • Prospectus | • Product Certification |
| • Associate Membership (Agencies) | • Newsletter/Reports |
| • Members by Focus Groups | • Internet Courses |
| • GSI Publications | • Geosynthetics Links |
| • GRI Specs, Guides, White Papers | • GSI Member Meetings |
| • CPReS | • Courses at GSI |
| • CPHyS | • CQA Insp. Cert. |

To go further one needs a members-only password. Your contact person (see the last section of this Newsletter/Report if you do not know who it is) must get a password from Marilyn Ashley. Marilyn can be reached by e-mail at mvashley@verizon.net. When you get into this section, the following information is presented. This includes:

- | | |
|------------------------------------|-------------------------------------|
| • GRI Test Methods | • Links to the GSs World |
| • GRI Reports | • Keyword Search for Literature |
| • GRI Technical Papers (Citations) | • Example Problems |
| • Notes of GSI Meetings | • Frequently Asked Questions (FAQs) |

The Keywords Section contains about 30,000 citations of all of the geosynthetics literature published in

English. It's quite easy to use provided that you have a specific topic, or area, in mind. This is the section of the website that we (and others we are told) use the most in our various activities.

In addition to the information provided in our home page as just mentioned, Jamie Koerner (Special Projects Coordinator) is performing various surveys of pertinent topics in geosynthetics. To date, she has focused on the following; all of which are available. Note that we are open to suggestions to other survey-related topics.

- State adoption of AASHTO M288 geotextile specification (GRI Report #31)
- State liner and cover regulations for solid waste disposal (GRI Report #32)
- International liner and cover regulations for solid waste disposal (GRI Report #34)
- Allowable leachate head in landfill sumps (White Paper #13)
- Allowable leakage rates for waste ponds (White Paper #15)
- Professional development hours (PDH's) required by the various states for continued licensure.
- Status of state environmental regulators with respect to conformance testing and levels of CQA at landfills and surface impoundments.
- Survey of LLRW at U. S. Defense establishments so as to assess the potential area for final covers. (This effort is just beginning.)

Progress within GEI (Education)

Free CD

We sent a broadcast e-mail to everyone stating that many power point presentations were available and would be sent upon request. Many persons replied asking for all of them. Therefore, we put all 63 presentations on a CD which was sent to all GSI contact persons. That said, we have many copies still available so do ask and we will mail it to you immediately. Topic areas are all types of geosynthetics, plus walls/slopes, landfills, specifications, and miscellaneous.

GRI Reports

To date, we have 40 GRI Reports available to members and associate members. These reports vary in length from 30 to 200 pages and beginning with Report #25 they are on the password protected section of our home page. Prior to that date only the abstract is available online. All of them, however, are available in hard copy. The most recent reports are as follows:

- #36 – Inadequate Performance of Geotextile Filters Under Different and Challenging Field Conditions
- #37 – Geosynthetic Supported Base Reinforcement Over Deep Foundations
- #38 – A Data Base and Analysis of Geosynthetic Reinforced Wall Failures
- #39 – Methods of Stabilizing Excessively Deformed MSE Walls
- #40 – On the Prevention of Failures of Geosynthetic Reinforced MSE Walls and Recommendations Going Forward (available July, 2010)

Courses

We have scheduled the following sequence of courses:

- Friday, December 3, 2010
MSE Wall Failures and Remediation (New Course)
- Tuesday, December 7, 2010
Design of Geosynthetics in Waste Containment Systems
- Wednesday, December 8, 2010
Quality Assurance/Quality Control of Geosynthetics Manufacturing and Installation

The above will be held at:

Geosynthetic Institute
475 Kedron Avenue
Folsom, PA 19033

(approx. 4.5 miles from Phila. International Airport)

Course Registration and Fee:

\$300/person for each one-day course (up to one month prior to course)

\$350/person thereafter

\$200/person – GSI Members

Contact: Marilyn Ashley (mvashley@verizon.net)

GSI Fellowships

We are pleased to announce the third class of GSI Fellows for the academic year 2010-2011. The basic criteria are as follows:

1. Student must have completed his/her doctoral candidacy examinations.
2. Student must be researching an innovative topic involving geosynthetics.
3. Student must express an interest and desire to teach and/or research in the geosynthetic field.

Four of the new proposals contained excellent projects which have been awarded. These four plus two first class students and one second class student (continuing their research projects) have been sent stipend checks accordingly. The status this year, i.e., the third class is as follows:

GSI Fellows – Academic Year 2010-'11

Class 1 (c) - Continuation

Number	Student	Advisor	University	Topic
3-08	Axel Ruiken	Martin Ziegler	RWTH Aachen	Geogrid behavior used in walls and slopes
4-08	Eleni Kapogianni	Michael Sakellairou	U. of Athens	Geosynthetic reinforcement of soil slopes under seismic conditions

Class 2(b) - Continuation

Number	Student	Advisor	University	Topic
4-09	Majid Khabbazian	Victor Kaliakin	U. of Delaware	Geosynthetic Reinforced stone columns and embankment stabilization

Class 3(a) - New Funding

Number	Student	Advisor	University	Topic
1-10	Tanay Karademir	David Frost	Georgia Tech	Experimental and numerical studies of elevated temperature effects on GS interface shear behavior
2-10	Jing Ni	Buddhima Indraratna	U. of Wollongong	Application of GS-PVD vertical drain under cyclic loads in stabilizing rail tracks
3-10	Bret Lingwall	Steven Bartlett	U. of Utah	Application of GSs to protect buried pipes at fault crossings
4-10	Carmen Franks	Ahmet Aydilek	U. of Maryland	GS filters for water quality improvement of urban stormwater runoff

Activities within GAI (Accreditation)

The Geosynthetic Accreditation Institute's (GAI) current mission is focused on a Laboratory Accreditation Program (LAP) for geosynthetic test methods. George Koerner is in charge of the program. The GAI-LAP was developed for accrediting geosynthetic testing laboratories on a test-by-test basis. GAI-LAP suggests that laboratories use ISO

17025 as their quality system model. In addition, the program uses the GSI lab as the reference test lab and operates as an ISO 17011 enterprise. In short, this means that the GSI lab does not conduct outside commercial testing.

It should also be made clear that GAI-LAP does not profess to offer ISO certification, nor does it "certify" laboratory results. GAI-LAP provides accreditation to laboratories showing compliance with equipment and documentation for specific standard test methods usually ASTM or ISO standards. In addition, GAI-LAP verifies that an effective quality system exists at accredited laboratories by way of proficiency testing.

There have been significant additions to the number of GAI-LAP tests. Presently, there are 208 GAI-LAP test methods available for accreditation. Please consult our home page for a current listing.

As of September, 2010, the following laboratories are accredited by the GAI-LAP for the number of test methods listed in parenthesis. Contact personnel, telephone numbers and e-mails are also listed.

- 1^A - TRI/Environmental Inc. (118 tests)
Sam Allen -- (512) 263-2101
Sallen@tri-env.com
- 3^A - Golder Associates (45 tests)
Jonathan Ellingson -- (770) 492-8280
Jellingson@golder.com
- 4^C - Geosynthetic Institute (116 tests)
George Koerner -- (610) 522-8440
gkoerner@dca.net
- 8^B - Propex, Ringgold (19 tests)
Todd Nichols -- (800) 258-3121
todd.nichols@propexinc.com
- 9^B - Lumite (10 tests)
Rebecca Page -- (770) 869-1700
rpape@lumite.com
- 13^A - Precision Laboratories, CA (95 tests)
Ron Belanger -- (714) 520-9631
rbelanger@precisionlabs.net
- 14^A - Geotechnics (61 tests)
J. P. Kline -- (412) 823-7600
JPkline@geotechnics.net
- 19^A - HTS Consultants Inc. (42 tests)
Larry McMichael -- (713) 692-8373
LMcMichael@htshouston.com
- 20^A - GeoTesting Express, MA (46 tests)
Gary Torosian -- (978) 635-0424
gtorosian@geotest.com
- 22^B - CETCO Hoffman Estates (13 tests)
Jim Olsta -- (847) 392-5800
jim.olsta@cetco.com
- 23^B - CETCO Cartersville (10 tests)
Chris Cunningham -- (706) 337-5316
chris.cunningham@cetco.com
- 24^B - CETCO Lovell (10 tests)
Roger Wilkerson -- (307) 548-6521
roger.wilkerson@cetco.com
- 25^B - Ten Cate, Pendergrass (11 tests)
Beth Wilbanks -- (706) 693-2226
beth_wilbanks@rtcusa.net
- 26^B - Agru America Inc. (17 tests)
Grant Palmer -- (843) 546-0600
gpalmer@agruamerica.com
- 29^E - FITI Testing and Research Institute (70 tests)

Hong-Kwan Kim -- 82-2-3299-8071
HKKim@fiti.com.re.kr

Marie Andre Fortin -- (450) 929-1234
MarieAF@solmax.com

- 31^D - NYS Dept. of Transportation (9 tests)
John Remmers -- (518) 457-4104
Jremmers@dot.state.ny.us
- 32^A - Vector Engineering (6 tests)
Ken Criley -- (530) 272-2448
criley@vectoreng.com
- 34^B - GSE Richey Road (28 tests)
Jane Allen -- (281) 230-6726
Jallen@gseworld.com
- 37^B - GSE Chile (21 tests)
Mauricio Ossa -- 56-2 6010153
Mossa@gseworld.com
- 38^C - Sageos/CTT Group (91 tests)
Eric Blond -- (450) 771-4608
eblond@groupectgroup.com
- 40^B - GSE Lining Technology Inc. (17 tests)
Vicki Parrott -- (843) 382-4603
Vparrott@gseworld.com
- 41^A - SGI Testing Service, LLC (19 tests)
Zehong Yuan -- (770) 931-8222
ZYuan@interactionspecialists.com
- 42^C - NPUST (GSI-Taiwan) (63 tests)
Chiwan Wayne Hsieh -- 011-886-8-7740468
CWH@mail.npust.edu.tw
- 43^A - Ardaman & Associates (18 tests)
George DeStafano -- (407) 855-3860
gdestafano@ardaman.com
- 44^B - BBA Fiber Web, Inc. (9 tests)
Ken McLain -- (615) 847-7575
k.mclain@fiberweb.com
- 45^B - Ten Cate Malaysia SDN Bhd. (23 tests)
C. P. Ng -- (603) 519 28568
cpng@tencate.com
- 46^B - Bentofix Technologies (13 tests)
Colin Murphy -- (705) 725-1938
cmurphy@gseworld.com
- 49^B - Engepol Geossinteticos (19 tests)
Carolina Polomino -- (55) 11-4166 3001
Carolina@nortene.com.br
- 50^B - ADS, Inc. Hamilton (7 tests)
Terry McElfresh -- (513) 896-2065
mcelfresh@ads-pipe.com
- 51^B - Solmax International Inc. (20 tests)
Simon Gilbert St. Pierre -- (450) 929-1234
simonGSP@solmax.com
- 53^B - Polytex Inquique (13 tests)
Cristian Valdebenito -- 011 56 57 42 90 00
cvaldebenito@polytex.cl
- 54^B - ADS, Inc. Finley (9 tests)
David Gonso -- (419) 424-8377
davegonso@ads-pipe.com
- 55^B - Atarfil Geomembranes (20 tests)
Iganacio Garcia Arroyo -- 34 958 439 278
larroyo@atarfil.com
- 56^B - Polytex Santiago (11 tests)
Jamie Morales -- 56-2-627-2054
Jmorales@polytex.cl
- 57^B - Ten Cate Cornelia (15 tests)
Melissa Medlin -- (706) 778-9794
mmedlin@tencase.com
- 58^B - Propex Nashville (9 tests)
Tim Smith -- (229) 686-5511
TimSmith@propeinc.com
- 59^B - Firestone (9 Tests)
Janie Simpson -- (864) 439-5641
SimpsonJanie@firestonebp.com
- 60^B - Polytex Lima (11 tests)
Elias Jurufe -- 51 16169393
Ejarufe@polytex.cl
- 61^B - Raven Industries (17 tests)
Justin Norberg -- (605) 335-0288
Justin.Norberg@ravenind.com
- 62^B - Solmax International Asia (14 tests)

- 63^A - TRI Environmental, Inc.; DDRF (4 tests)
Joel Sprague -- (864) 242-2220
JSprague@tri-env.com
- 64^B - Agru America (NV) (14 tests)
Chris Adams -- (775) 835-8282
- 65^C - Bombay Textile Rsearch Assoc. (BTRA) (24 tests)
Riyaz Shaikh
(0) 022-25003551
btra@vsnl.com
- 66^B - Rowad International Geosynthetics Co. Ltd (14 tests)
Asad Ullah Khan -- +966-3-812-1360
usad@rowadplastic.com
- 67^A - MicroBac Hauser Division (8 tests)
Erin Hensley -- (720) 406-4806
ehensley@microbac.com
- 68^B - Glen Raven Technical Fabrics LLC (3 tests)
David Seagraves -- (336) 229-5576
dseagraves@glenraven.com

^AThird Party Independent ^CInstitute
^BManufacturers QC ^DGovernment

If you are interested in this program and would like a copy of the GAI-LAP directory, please advise accordingly. A directory is published annually in December of each year, and is also kept current on GRI's Home page at <http://www.geosynthetic-institute.org>. For additional information on the GAI-LAP program contact:

George R. Koerner, Ph.D., P.E., CQA
 Geosynthetic Institute
 475 Kedron Avenue
 Folsom, PA 19033-1208
 Telephone: (610) 522-8440
 Fax: (610) 522-8441
 E-mail: gkoerner@dca.net

Activities within GCI (Certification)

Due in part to the active interest by many GSI members and associate members we present a tabular summary of the Inspectors Certification Program. The table gives the pass/fail statistics by year as well as insight as to the impact of taking a course before the written examination. In looking at the data it appears as though the exam is reasonably difficult and is at an appropriate level for today's CQA personnel.

Inspector Certification Test Results 2006 – 2010

Year	Geosynthetic Materials		Compacted Clay Liners		Commentary
	No. of people taking exam	No. of people failing exam	No. of people taking exam	No. of people failing exam	
2006	141	5 (3%)	128	12 (9%)	2 (1.5%)
2007	82	11 (13%)	73	12 (16%)	7 (8.5%)
2008	95	25 (25%)	89	20 (23%)	13 (14%)
2009	36	6 (17%)	36	2 (6%)	2 (6%)

2010	19	6 (31%)	15	0	0
TOTAL (to date)	373	53 (14%)	341	46 (13%)	24 (6%)

With the onset of 2011, we will be in our fifth year of operation and the existing certifications are for 5-years. Thus, decisions must be made. In concert with the program's steering committee it presently appears that

- (i) there will be no follow-up testing required for presently certified people,
- (ii) there will be a required performance report required of presently certified people,
- (iii) there will be a review and maintenance fee but the amount and time period are still under discussion... more later

The GSI Affiliated Institutes

It has long been realized that the information generated within the GSI group should have a timely outlet to all countries, and in all languages. To this end, GSI has created affiliated institutes in two countries (Korea and Taiwan), and potentially others in the future. These affiliated institutes are full members of GSI and are empowered to translate and use all available information so as to create similar institutes and activities in their respective countries.

GSI-Korea was formed on February 9, 1998 as a collaborative effort between FITI Testing and Research Institute (a quasi-government organization) and INHA University (through its Geosynthetics Research Laboratory).

FITI is a 30-year old testing organization located in Seoul focusing on interlaboratory proficiency; environmental protection; safety and flammability; hazardous substances; in-house quality control; consumer protection; complaint analysis; quality marking; procurement; household and industrial applications; and materials approval. The geosynthetics testing group within FITI has twelve people (two with doctoral degrees) and 10 engineers. The geosynthetic laboratory is GAI-LAP accredited for 70 geosynthetic test methods. Dr. Jeonghyo Kim is the general manager within FITI's geosynthetics activities.

INHA University is located in Incheon and the geosynthetics laboratory is led by Professor Han-Yong Jeon. Dr. Jeon has 10-students working on geosynthetic-related projects and is extremely active both nationally and internationally.

GSI-Taiwan was formed on August 18, 2000 and is wholly contained within the National Pingtung University of Science and Technology in Nei Pu, Pingtung (southern Taiwan). It completely parallels GSI in that it has specific units for research, education,

information, accreditation and certification. The Director is Dr. Chiwan Wayne Hsieh who is a Professor in the Department of Civil Engineering and Dean of the R & D Office. GSI-Taiwan has an Taiwanese consortium of geogrid/geotextile manufacturers who work toward producing quality products according to the draft GRI geogrid specifications and the associated test methods. As such, GSI-Taiwan is a GAI-LAP accredited laboratory for 59 geosynthetic test methods. Dr. Hsieh has 10-students working on geosynthetic-related projects and is extremely active nationally and internationally. GSI Taiwan has hosted three very successful conferences to date and is now embarking on a much broader one, namely, GSI-Asia. It is set for November 16-18, 2010 in Taichung, Taiwan. See "Upcoming Events" for details.

Items of Interest

1. CRS Suggests New Law to Help EPA Regulate Coal Combustion Waste

As the EPA considers various controversial alternatives to regulating coal combustion waste (CCW) from power plants, the Congressional Research Service (CRS) is suggesting that Congress add a new subtitle to federal waste law to give EPA enforcement authority over CCW without declaring it hazardous and to regulate its beneficial reuse. The Aug. 9 report, "Regulating Coal Combustion Waste Disposal: Issues for Congress," suggests that lawmakers consider amending the Resource Conservation & Recovery Act (RCRA) to create a new subtitle K "that would specifically address issues to the management" of CCW. GSI (as well as a major effort by GMA) has given input into this process and is somewhat skeptical about this recent turn-of-events. Do contact us if desired.

(ref. Waste Business Journal 2010)

2. Taxing the Natural-Gas Industry

Of 32 states with natural-gas drilling, only Pennsylvania, Virginia, New York, and Maryland do not tax gas extraction. Pennsylvania was the highest producer of the four.

State	2007 Production (million of ft ³)	Current tax rate
1. Texas	6,091,724	7.5% of market value of gas produced. Reduced tax rate for "high-cost wells"
2. Wyoming	1,923,224	6% of gross sales minus processing and transportation costs
3. Oklahoma	1,744,393	7% of average monthly price of gas plus 0.095% excise tax

4. New Mexico	1,544,830	8.67% to 9.5%
5. Louisiana	1,363,538	\$0.331 per million cubic feet
6. Colorado	1,242,571	2% to 5% of gross income
7. Alaska	433,485	25% to 50% of net income
8. Utah	376,409	5% for gas over \$1.50 per million cubic feet
9. Kansas	365,877	4.33%
10. California	307,160	Conservation fee of \$0.00880312 per million cubic feet
11. Alabama	270,407	2% production tax and 4% to 8% privilege tax
12. Arkansas	269,886	5%
13. Michigan	264,907	5.25% (5% tax and 0.25% oil and gas fee)
14. West Virginia	231,184	5% plus \$0.47 per million cubic feet
15. Pennsylvania	182,277	None

(ref. *The Philadelphia Inquirer*, Oct. 24, 2009)

3. Fabric Structure Prevent Pollution – Composting is a core principle of sustainable farms and cities. But if done incorrectly, it can also be a source of pollution. “Let’s say a municipality is accepting food scraps, leaves, brush and other garbage that they want to compost,” says ClearSpan’s Barry Goldsher. “If they are composting outside, all it takes is a heavy rainstorm to make a godawful mess. Often all of the feedstuffs for the process will end up in the groundwater. As a result, new federal and state regulations are popping up, requiring composting operations to be covered. Once again, it a job for fabric.”

Gases are an even more acute problem for livestock operations. The concentrated animal feeding operations (CAFOs) that are the source of most U.S. meat are notorious for foul odors—the kind that sicken people and make nearby homes impossible to sell. That’s why John Baumgartner, president of Baumgartner Envirionics Inc., Olivia, Minn., decided to develop a new kind of lagoon cover called Bio-Cap®.

Manure lagoons are anaerobic systems. When organic matter breaks down anaerobically—without air—there are basically two types of bacteria at work: acetogens and methanogens. Acetogens break down long-chain fatty acids into short-chain volatile fatty acids. Many of these compounds are intensely odorous. Methanogens break down the short-chain volatile fatty acids into compounds that don’t smell, such as carbon dioxide, water-vapor, nitogren gas and methane.

Several fabric-related solutions are suggested for containment; (i) permeable polypropylene nonwoven geotextile needlepunched with a closed-cell foam for flotation, and (ii) a UV-treated polypropylene fabric.
(ref. *Special Fabrics Review*, 3/25/2010)

4. Vision for CE’s in 2025

In June, a diverse group of civil engineering and other leaders gathered in Lansdowne, Virginia, to participate in the Summit on the Future of Civil Engineering. Their purpose was to articulate a global vision for the future of civil engineering, addressing all levels and facets of the civil engineering community. Their report, prepared by the ASCE Steering Committee to Plan a Summit on the Future of the Civil Engineering Profession in 2025, was published in June.
(ref. *Civil Engineering*, August, 2010)

Are we Missing the (Sustainability) Boat?

Perhaps its only perception, but I think that geosynthetics have made such significant inroads in myriad applications is based exclusively on cost comparisons. Cost can enter into decisions as to use geosynthetics (over related materials) or not in one of two ways;

- (i) to provide equivalent performance at a lower cost, or
- (ii) to provide better performance at an equivalent cost.

Either way, cost seems to be the pivotal issue of whether or not to use geosynthetics for whatever application is under consideration.

The above said, perhaps we (really everyone involved in geosynthetics) are overlooking a major feature which could, or should, go side-by-side with cost. That feature has to do with sustainability and, more specifically, with the carbon footprint of a geosynthetic solution compared to a natural material solution, i.e., concrete, steel, gravel, clay, etc. In this regard, the carbon footprint of the contrasting solutions can be readily quantified insofar as their respective carbon dioxide (CO₂) emissions.

At the outset, recognize that there is a large body of information available for calculating CO₂ emissions. A recent report, however, has taken this type of information and “distilled” it directly into the geosynthetics mainstream. The report is titled:

“Sustainable Geosystems in Civil Engineering Applications”
by
Waste and Resources Active Programs (WRAP)
May, 2009

It is authored by representatives of sixteen U.K. organizations of which one-third are geosynthetic manufacturers. In it are a number of worked-out case studies, see Table 1. They address both slopes and

walls and show that when replacing traditional material solutions with geosynthetic reinforcement materials, costs are greatly reduced (as expected) and the CO₂ footprint is reduced even more so. The differences shown in the following table are apparent.

Case Studies from WRAP Report (May, 2009)

Case No.	Application (Traditional)	Traditional Approach		Geosynthetic Approach	
		Cost (K)	CO ₂ Footprint (tons)	Cost (K)	CO ₂ Footprint (tons)
1	Slope Stability	\$571	157	\$23	21
2	Bridge Approach	\$1282	500	\$574	346
3	Crib Wall	\$51	35	\$41	11
4	Sheet Piling Wall	\$246	433	\$121	69
5	Concrete Wall	\$98	107	\$20	20

Excited about the realization of drastic CO₂ reductions using geosynthetics, we decided to build our annual conference around such a sustainability theme. GRI-24 will be held in Dallas, Texas on March 16, 2011 and is embedded into the larger Geofrontiers II Conference at the same location. (Organized by IFAI; see www.geofrontiersII.com)

Our keynote lecture will be by Russell Jones of Golder Associates (U.K.) who was one of the authors of the WRAP Report. Dr. Jones will be followed by two sessions (morning and afternoon) as follows:

The GRI-24 Conference
Wednesday, March 16, 2011, Dallas, Texas
Optimizing Sustainability Using Geosynthetics
(Tentative Program)

Session I – Transportation/Geotechnical Related

2. Jeff Rasche of TenCate on “Paving Fabrics”
3. Thomas Egloffstein of ICP Consultants on “Subgrade Stabilization”
4. George Koerner of GSI on “Plastic Pipe”
5. Sam Allen of TRI on “Erosion Control Methods”
6. Richard Goodrum of Colbond on “Green Roofs”
7. Garry Gregory of Oklahoma State on “Embankment Enhancement”
8. Archie Filshill of CETCO Contracting on “Storm Water Retention Systems”
9. Kent von Maubeuge of NAUE on “Climate Changing Gases”

Session II – Environmental/Hydraulic Related

10. Don Hullings of Jones Edmunds on “Landfill Footprint Alternative”
11. Doug Brown of Tensar on “Landfill Berms”
12. Chris Athanassopoulos of CETCO on “GCLs vs. CCLs”

13. Aigen Zhao of SynTec on “Drainage Geocomposites”
14. Paul Oliveira of Firestone on “GMs in Reservoirs”
15. Boyd Ramsey of GSE on “GS Installation Issues”
16. Michael Ayers of Agru on “Synthetic Turf”
17. Archie Filshill on “Nanocomposites”
18. Grace Hsuan of Drexel on “GS to Produce Algae”
19. Wayne Hsieh of GSI Taiwan on “River Bank Protection”
20. Bob Koerner of GSI on “Exposed Geomembrane Landfill Covers with Gas Collection and Solar Panels”
21. Richard Goodrum of Colbond on “Levee Protection Using (RCC, ACB, TRM) Alternatives”

Please join us in Dallas!

Bob Koerner

Upcoming Events

- November 16-18, 2010
GSI-Asia
Taiwan
Contact: cwh@mail.npust.edu.tw
Contact: www.asce.org/webinars
- November 22, 2010
ASCE Webinar on “Geosynthetics in Hydraulic Structures”
Contact: www.asce.org/webinars
- December 3, 2010
MSE Wall Failures and Remediation
GSI, Folsom, PA
Contact: mvashley@verizon.net
- December 7, 2010
Waste Containment Design and Behavior
Contact: mvashley@verizon.net
- December 8, 2010
Quality Assurance and Quality Control of Waste Containment Systems
Contact: mvashley@verizon.net
- March 7, 2011
ASCE Webinar on “Overview and Introduction to Geosynthetics”
Contact: www.asce.org/webinars
- March 13-16, 2011
GeoFrontiers II
Dallas, TX
Contact: tylindemann@ifai.com
- March 16, 2010
GRI-24 Conference
Geosynthetics in Sustainability
Dallas, TX
Contact: mvashley@verizon.net

GSI's Member Organizations

We sincerely thank all of our sponsoring organizations. Without them, GSI simply could neither happen nor exist. The current GSI member organizations and their contact members are listed below. Recent member organizations are; Afitec-Textel with Pascal Saunier as contact person; EVAL Americas (Kararay) with Robert Armstrong as contact person, and In-Line Plastics with Mark Williams as contact person. The newest associate member is Oak Ridge National Lab with Dr. Amit Shyan as contact person. Thanks to all and welcome to GSI.

GSE Lining Technology, Inc.

Boyd Ramsey [BoD]

AECOM

Kevin McKeon/Ken Bergschultz/John Trast

U.S. Environmental Protection Agency

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Oak Ridge National Laboratory

(c/o Savannah River Remediation LLC)

Amit Shyan

IN THE NEXT ISSUE

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- Activities within GAI (Accreditation)
- Activities within GCI (Certification)
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