

**AEIC 2008 Fall Meeting
October 1-2, 2008
St. Paul, Minnesota**

P.L. Hunst, AEIC Secretary

The AEIC would like to thank BioDiagnostics, Inc. (River Falls, WI) for hosting the meeting and making all the local arrangements in St. Paul, MN.

AEIC BUSINESS MEETING

Secretary's Minutes (P.L. Hunst): The Secretary's minutes of the 2008 Spring Meeting were approved by the membership and are posted on the AEIC website.

Treasurer's Report (D. Layton):

	Projected	Actual (YTD)
Beginning Balance (January, 2008)	\$12,399	\$12,399
2008 Membership Dues	8,000	9,400
TOTAL REVENUE	8,000	9,400
Expenditures		
Scientific Paper	4,000	
Delaware Franchise Tax	25	25
Wire Transfer Fee	25	
ANSI/ISO	2,750	
Board Meeting	100	
2008 Spring Meeting	1,000	1,162
Website	500	116
2008 Fall Meeting	1,000	
Poster for Como Meeting		50
Brochure Reprints	300	283
Subscriptions	100	500
Miscellaneous	100	25
TOTAL Expenditures	10,524	19,649
Certificate of Deposit	10,000	10,000
Interest	500	804
TOTAL BALANCE	21,024	30,253

The Treasurer's report was approved by the membership.

Membership Update (D. Layton):

Classification	Number	Potential Dues	Unpaid	Amount Due
Large Companies	15	\$7500		
Small Companies	9	2250		
Associate Members	2	100		
Individual Members	2	200		
TOTAL	28	10050	2	300

AEIC Brochure (D. Layton): A second printing of the brochure was done. D. Layton has the reprints available for members who would like copies for distribution. Members can request copies via e-mail to D. Layton (dean.layton@envirologix.com).

AEIC Website (P. Hunst/G. Clapper): The new webmaster, Mandy Stockstad, had done a great job in revising the website and meeting requests for updates. Previously, a comment had been made that the Frequently Asked Questions (FAQs) section on the website is out of date. G. Clapper agreed to assemble a small workgroup to put together updated FAQs. The membership was polled for volunteers and only one person agreed to help. At the meeting, Y. Dudin, M. Thompson and R. Shillito all volunteered to assist G. Clapper in putting together new FAQs. It was also suggested that a counter be placed on the website to determine how many “hits” the website is receiving. Another comment was made that the website should be optimized so that it would be picked up more readily in “Google” searches.

AEIC Board Nominations (G. Clapper): At the 2008 Spring Meeting, it was proposed that the by-laws be changed such that the Vice President move into the President office as the President moves to the Past President office. This would allow continuity on the Board and also, in the meeting planning, the Past President would take charge of the Spring Meeting planning and mentor the Vice President so that the Vice President would be in charge of the planning for the Fall Meeting. It was discussed and decided that the Board would draft an amendment to the by-laws and present it to the membership at the 2009 Spring Meeting. Nominations for President and Vice President were requested from the membership. The following nominations were made at the meeting:

President: Mike Thompson (Illumina), Ray Shillito (Bayer CropScience)

Vice President: Denise Thiede (BioDiagnostics), Yelena Dudin (Monsanto), Frank Spiegelhalter (Eurofins GeneScan)

Additional nominations from the membership may be made via e-mail to the AEIC Secretary (PLHunst@dow.com) by October 10, 2008.

Update on 1st GMO Conference (R. Jenkins): R. Jenkins (G.Ronald.Jenkins@usda.gov) requested those members who attended the conference to send him feedback as to “what was good” and “what could be improved”. R. Jenkins will be attending a meeting in

January, 2009 where the discussion will center on the possibility of a 2nd Global GMO Conference. The location has not yet been discussed/decided but some organizers of the first conference will advocate to have it in Como, Italy again. Some AEIC members suggested it be in Asia (Japan or China?) rather than in the EU.

ILSI Workshops (R. Shillito): The International Life Sciences Institute (ILSI) has been active in sponsoring “hands-on” workshops on sampling and detection methods for GMOs. In 2008, workshops have been held in Singapore and Chile and will be held in Bogota, Colombia. The workshops cover the basic issues of sampling and of the detection methods as well as providing laboratory exercises using the detection methods. In 2009, workshops are planned in China, Peru and Africa.

2009 Spring Meeting (G. Clapper): The 2009 Spring Meeting will be hosted by Monsanto in St. Louis, MO on April 1-2. The proposed topics for the meeting included:

- Update on the Biosafety Protocol (D. Grothaus/R. Shillito to find speaker)
- Emerging diagnostics for biofuels (G. Clapper to coordinate)
- Testing when there is non-specific protein in the seed/grain (Monsanto to provide speaker)
- Environmental stresses on seed production (R. Jenkins to provide speaker)
- Varietal purity (Pioneer to provide speaker)
- Diagnostics for mycotoxins, pesticide residues, microbiology
- Bee colony update (M. Sussman to provide speaker)
- New member presentation: Illumina (M. Thompson)

AEIC Goals/Objectives (G. Clapper): Suggested goals/activities included:

- ILSI: Member support needed to update ILSI slides for workshops (Y. Dudin, D. Mittanck, K. Brix-Davis, R. Jenkins, F. Spiegelhalter, D. Thiede, N. Henderson, R. Shillito)
- Should AEIC offer to provide some financial assistance to members to offset some of the costs associated with attending an ILSI workshop?
 - The AEIC Members have always been very willing to teach these workshops. However, many of the active volunteers have changed careers over the past few years, and the pool of available experts with the ability to financially support the travel has decreased. Is it possible for AEIC to distribute some funding to sponsor a member to participate in teaching at a Workshop if the Member’s company is unable/unwilling to shoulder the complete financial cost? Discussion indicated that this should be a possibility on a case by case basis. A Member would need to approach the Board of Directors with the request. The Board would then decide the amount based on discussion and the current bank balance.
- AEIC Website
 - Ask webmaster to add counter to FAQ and slides pages to determine how many people actually visit and potentially use information. Data will be

examined at 2009 Spring Meeting to see how much time the Membership should spend on updating FAQs and slides.

- Suggestion made to add more keywords to Google Search so website is listed when someone searches for “AEIC” or “biotechnology”. Julie Gore (BioDiagnostics) offered to assist webmaster with this, if necessary.

Business meeting was adjourned (motion made, seconded and voted in favor).

INVITED TALKS

Introduction from BioDiagnostics, Inc. (Q. Schulz): The mission of BioDiagnostics, Inc. (BDI) is to enhance customer success by creating innovative solutions to meet the changing needs of the seed industry. BDI was established in 1996 and is located in River Falls, WI. The company currently has 90 employees and is independently owned. To date, BDI has tested 600,000 samples over the 12 years of its existence. BDI currently has 300 accounts in the U.S. and 39 accounts international accounts. The company is organized into six (6) laboratories: standard seed testing, isozyme electrophoresis, iso-electric focusing, ELISA, DNA (PCR), analytical chemistry. BDI provides services for varietal purity, transgenic trait analysis, molecular breeding support, seed viability/vigor and chemical analysis. The types of testing that the labs provide includes germination/bioassays, ELISA Bt analysis, hybrid/inbred purity, DNA analysis and GC/HPLC analysis. One of BDI’s basic tenets is professionalism and as such employs registered seed technologists and a certified crop advisor. In the area of accuracy, i.e., test programs to provide accurate results, protocols and controls are validated. BDI is ISO 9001:2000 certified and was the first accredited seed lab in the U.S. The company participates in proficiency testing programs such as USDA GIPSA rice PCR, ISTA AP ring test, ISALC corn/soybean reference, SCST cotton referee and SCST proficiency program. For its customers, BDI provides standard reporting, customized reporting and online access 24/7. BDI views its value to the industry as an independent third party testing facility which advocates professionalism and accuracy. BDI has growth capacity, embraces accreditation as a watchdog, has cutting edge data delivery and has a lot of experience in the seed industry.

ISO 101 (G. Clapper – AOCS): ISO’s mission is to promote the development of standardization and related activities in the world with a view to facilitating the international exchange of goods and services, and to developing cooperation spheres of intellectual, scientific, technological and economic activity. AEIC’s involvement with ISO began in 2001 and AEIC has helped fund a TAG (technical advisory group) for the last 6 years. The General Assembly of ISO consists of the Principal Officers and delegates of the member bodies, correspondent members and subscriber members. The ISO Council stems from the General Assembly and the Technical Management Board reports to the Council. The TAGs and the technical committees report into the Technical Management Board. The TAGs and technical committees are where the AEIC has been involved. ISO standards are the output of ISO and are developed via consensus, are industry-wide and are voluntary. In consensus, the views of all interests are taken into account. The standards are meant to be industry-wide to provide global solutions to

satisfy customers and industries globally. International standardization is market-driven and is therefore based on voluntary involvement of all interests. Participation in ISO provides an international voice, TAGs balance their membership equally among government, industry, academia and participation provides access to all versions of standards under development. Observers cannot vote. ISO is building a strategic partnership with the World Trade Organization (WTO) and provides technical support to WTO programs such as Codex. There is a financial component to participation—people, time, travel (both national/international) and U.S. TAG administrative fees.

The U.S. TAG functions include recommending P- (participate) or O- (observer) membership on an ISO TC or SC (sub-committee), recommending a change in membership status on a TC/SC, initiating and approving U.S. proposals for new work items through ANSI (official standards organization to ISO from U.S.) for consideration by a TC/SC and initiating/approving working drafts through ANSI. The U.S. TAG provides adequate U.S. representation to ISO TC or SC meetings, designates membership and heads of delegations as well as determines U.S. positions for ISO TC/SC meetings and advises the U.S. delegation of any flexibility it may have. The U.S. TAG also nominates technical experts for ISO working groups (WGs). The administrator is appointed by ANSI and organizes the US TAG. The administrator also provides administrative services such as arranging meetings, preparation/distribution of documents, maintenance of meetings and communication of ballot results. The administrator will also transmit proposals from TAG to ANSI and ensures compliance with applicable ANSI/ISO procedures.

The stages of development of international standards include: a) proposal, b) preparatory, c) committee, d) enquiry, e) approval, and f) publication. The proposal stage is the new work item proposal. In the preparatory stage, a WG of experts works on successive working drafts, with the final one being forwarded to the WG's parent committee for consensus building. At the committee stage, the draft is distributed and voted on by P members. Text is then finalized as a draft international standard (DIS). The DIS is circulated to all ISO member bodies for a 5 month review during the enquiry stage. A 2/3 majority vote is needed for approval for submission as a final draft international standard (FDIS). At the approval stage, no technical comments are accepted. A final yes/no vote (requiring a 2/3 majority with not more than 1/4 of total votes being negative) is taken to approve the text as an international standard. Once a FDIS has been approved, the final text is sent to the ISO Central Secretariat which publishes the International Standard. All International Standards are reviewed at least once every 5 years by responsible TCs/SCs. A majority of the P-members of the TC/SC decide whether an International Standard should be confirmed, revised or withdrawn. Voting on standards is done by the standard organizations that are members of the ISO. ANSI is the voting member for the U.S.

ISO TC 34 Secretariat is AFNOR and ABNT. The WGs include:

WG 7 Genetically Modified Organisms and Derived Products (now part of SC 16)
WG 8 Food Safety Management Systems

WG 9 Traceability System in the Agriculture Food Chain
WG 10 Nitrogen Determination by the Dumas Principle
WG 12 Quality Management Systems for Grain Production

The SC of TC 34 include:

SC 2 Oleaginous seeds and fruits (U.S. is participating member)
SC 3 Fruit and vegetable products (No U.S. membership)
SC 4 Cereals and pulses (U.S. has observer status)
SC 5 Milk and milk products (No U.S. membership)
SC 6 Meat, poultry, fish, eggs and their products (U.S. is participating member)
SC 7 Spices and condiments (U.S. has observer status)
SC 8 Tea (No U.S. membership)
SC 9 Microbiology (No U.S. membership)
SC 10 Animal feeding stuffs (No U.S. membership)
SC 11 Animal and vegetable fats and oils (U.S. is participating member)
SC 12 Sensory analysis (U.S. is participating member)
SC 14 Fresh, dry and dried fruits and vegetables (No U.S. membership)
SC 15 Coffee (U.S. is participating member)
SC 16 Horizontal methods for the detection of molecular biomarkers in: foods, seeds and propagules of food crops; commodity food crops; fruits; vegetables and derived foods

For SC 16, the U.S. is the Secretariat and three WGs have been proposed:

WG 1 Detection of specific molecular biomarkers in seeds and food plants and foodstuffs
WG 2 Varietal identification
WG 3 Detection of potential pathogens of seeds and plants

WG 1: Implementation of ISO TS21098 and review at appropriate time: ISO 21572 – Protein-based methods; ISO 21569 – Qualitative nucleic acid-based methods; ISO 21570 – Quantitative nucleic acid-based methods; ISO 21571 – Nucleic acid extraction; ISO 24276 – General requirements and definitions. It is also proposed that ISO/TC 34/N1081 Foodstuffs – “Detection of genetically modified organisms in oleaginous seeds” be added to the work program.

WG 2: Determination of performance criteria for the use of microsatellites and other DNA- and protein-based molecular markers for cultivar identification, germplasm screening. Also, the determination of molecular markers for wheat gluten strength and standard marker set for tomatoes.

WG 3: Determination of performance criteria for the use of biomolecular methods to detect and identify plant pathogens.

Endogenous Reference Genes (M. Holden – NIST): NIST is a non-regulatory agency which helps U.S. industry on standardization and develops measurement technology.

NIST, along with USDA GIPSA and ILSI, is part of the CropLife International project on international methods harmonization looking at the 35S promoter for genetically modified quantitation. The first step in the project is to conduct an international survey on the use of the 35S promoter as a quantitative target and then identify a method that can be validated for as many events in commerce that carry the promoter. If necessary, reference material would be developed for calibration or quality control. ILSI is sending out questionnaire to labs to inquire as to the current or past use of a quantitative method for the promoter, what type of method, whether the method is in-house or published, the calibrants, reference materials, quality assurance with the method and the applicability of the method. CropLife International (CLI) members will provide, under confidentiality agreements, proprietary sequence information and seed. NIST will align/compare sequences to find regions of homology, decide on the extraction method, evaluate the published methods that target homologous sequences and then determine which published methods might be suitable and evaluate them. USDA GIPSA will research the appropriateness of endogenous gene targets for relative quantitation and participate in the extraction method evaluation.

Since the lawyers are currently working on the confidentiality agreements, a screening project was carried out in 2007 to screen the published 35S methods on reference materials, test the primer pairs at the concentration recommended, substitute SybrGreen for Taqman probe and make dilution series of DNA for PCR assays and test each method with all materials on same plate. DNA was extracted from seven IRMM maize reference materials, dilutions of 1:2 were made of the DNA and then all samples for each method were evaluated on the same plate. Three of the five methods gave reasonable results with the seven reference materials. Two of the methods worked with six of the maize events. Overall, the 35S sequences differ between the events so there is a need for methods that work for all events. This is important because countries are using the 35S promoter to quantify the GM content of grain.

Registered Genetic Technologist Program (A. Hall – SCST): The Society of Commercial Seed Technologists (SCST) promotes professionalism, ensures proficiency and accurate/timely information. The SCST was established in 1922 and promotes training/credibility of seed company analysts, acts as liaison between ASTA and regulatory laboratories such as AOSA. The SCST members are from all sectors of industry – government, companies, etc. In 2001, genetic seed testing was established to create a forum to share knowledge/experience as well as educate analysts and standardize methods. A certification process has been developed which is important to quantify/measure marketable technical skills, allows access to SCST resources, promotes personal achievement and is beneficial to the employer and seed industry. Registered technologists have accreditation, are full voting members of society. All applicants take a molecular genetics exam and must have accumulated 100 points to take the exam. The application is once a year (every March) and unanimous approval is required. The written exam is only given at the SCST annual meeting and is scored by members of the Board. The practical exam is a proctored exam. Samples and exams are sent to the proctor and the applicant must complete the exam within 6 weeks. The exam is graded by Board of Examiners. In order to take the practical exam, an applicant must score 70%

or higher on the written exam and must have 80% or higher on both exams to pass. Membership requires continuing education every 3 years. A proficiency testing program is currently under development. Resources such as study guides for the test, training manual, seed technology DVDs and herbicide bioassay study guide are available on website at www.seedtechnology.net.

Seed Chipping (H. Forbes – Monsanto): H. Forbes is located at Monsanto's Ankeny, Iowa site and is the Sample Process Technology Lead.

Marker-assisted breeding rapidly increases the frequency of favorable genes. Multiple cycles of marker-assisted breeding increases the frequency of favorable alleles associated with agronomic traits.

Cycle:

Seed chipping → DNA extraction → Generate marker fingerprint → Data analysis →

Selection/recombination

Seed chipping allows chipping the seed to obtain a sample which can be analyzed for genotype and then seed can still be planted.

A virtual tour of the seed chipping equipment/process was given via DVD. Seed is loaded into the chipper. The chipper singulates the seed and each individual seed encounters a specially designed saw that removes a portion of the seed as powder. The seed powder is sent to a specific well on a plate and the remaining seed is delivered to a seed tray. Fifteen thousand (15,000) samples can be collected in a single day. The DNA is extracted from the powdered samples and analyzed by a robotic system. The results are loaded into a database which the breeders can access to determine which seed they want to plant. The selected seeds are pulled out of the seed tray and sent to the breeder. To find 2 million seeds with desired traits would require the sampling of 8 million seeds. This is tedious, time-consuming process utilizing leaf analysis. The seed chipper overcomes this hurdle.

The seed chipper was designed and built in-house and patents are pending. Seed chipping is used as part of the seeds and traits pipeline. It was used to advance the RR2 soybean. Every new RR2Y line will have gone through the seed chipping process which allowed the earlier commercialization of the product. The genotyping relies on an automated DNA extraction and PCR assembly system. The PCR product information is sent to a global database for the breeders. Monsanto partnered with Velocity 11 to custom build a PCR system to fully utilize the power of seed chipping.

The chipped seed is sent to an automated warehouse for storage where it can be retrieved and sent to breeding stations. When a breeder chooses a seed, the seed trays are brought out of the warehouse and then an automated arm "cherry picks" the desired seed from the plates. Bulks of seed are created and mailed to breeder or nursery.

The advantages of seed chipping are: 1) allows analysis of each seed before planting and only those seeds with product potential are planted; 2) seeds lacking competitive genetics are discarded early in the breeding process; 3) improves efficiency. Monsanto is currently using the technology on corn and soybean. Monsanto has also invested in a MRI unit to use for fatty acid analysis in seed.

Seed Production 101 (B. Reschly – Syngenta): On corn, the male (tassels) and female flowers (ears) are not together. Female parents have their tassels removed. Generally, hybrids are produced by using a 4/1 pattern—4 rows female parent : 1 row male parent. Detassling may be accomplished by machine (basically a lawnmower blade cuts the tassel off the top of the plant). A puller pulls the tassel up and out. Hand detassling is necessary in a cut field to remove the tassels that the machines missed. Each company has a set of SOPs which detail the isolation distance depending on the purpose of the seed. Isolation distances range from 300, 660 to 1750 feet. Seed corn is processed as follows:

Intake

→Husking/sorting→Drying→Shelling/cleaning→Sizing→Bagging→Warehousing

Seed corn is picked on the ear using a picker rather than combine. The ears are dumped into a truck for transport. Trucks may have a walking bed which minimizes mechanical damage to the ears. The ears are moved from the truck to the seed facility via belts to again minimize mechanical damage. Husks are removed by rubber rollers with spikes. The ears are manually sorted to remove off-types, unhusked ears and diseased ears. Seeds are loaded into driers using drop belts and the drying process takes 72 hours. The shelled seed is run through an air cleaner which makes a cut of the very small kernels and very large kernels and inert matter. Seeds are then moved into bulk storage to await conditioning. A sizeout prediction is made using 1000 g from the sheller. The sample is broken down by size on a series of round and slot screens. The data is entered into a bag prediction calculation file to predict the number of finished units. The rest of the sample is sent to the QC lab to determine germination/vigor, trait, genetics and growout. A bagging decision is then made, i.e., to condition the seed or discard it. Waste can go to an elevator for feed. If the seed is treated, the company must pay to dispose of it via an appropriate method such as incineration.

Seed sizing is accomplished by the use of a variety of screens. Round hole screens (22-19-16 mesh) are used for the initial cuts. Slotted screens are used to sort for flats and rounds. A color sorter is used to remove damaged or diseased seed to reduce the amount of seed going over gravity tables. The color sorter is not useful for sorting out damaged seeds. The gravity table is a perforated table through which air is forced. The lighter, damaged seed ends up on the lower level of the table. After the gravity table, the seed is treated with fungicides/insecticides and then bagged. Seeds are bagged on the basis of seeds per pound. Analysis tags are attached and sewn onto the bags. The bags are palletized in warehouses. Finished product testing includes warm germination, physical purity, cold vigor trait testing and GM purity.

Using Seed Crush Method in Seed Testing (D. Thiede – BioDiagnostics): For insect resistance GM traits, 96% or higher purity is required depending on the crop. For herbicide tolerance, 96 or 98% purity is required which is tested via a 400 seedling assay. Trait negative seedlings may result from selfing of female, outcrossing, planting errors, seed mixes. Genetic purity may be used to determine the root cause of trait negative seedlings.

The advantages of the seed crush method are the rapid results and less potential for bias in sampling due to germination or seedling growth. The disadvantages are that the protein must be expressed in the seed and if the expression is low, the assay may need to be more sensitive. Seeds are complex, consisting of an embryo, endosperm and seed coat. There are multiple generation in one entity with different ploidy's. The seed coat is totally maternal, the endosperm is triploid (two doses maternal and one dose paternal) and the embryo has one dose maternal and one dose paternal. If the trait is on the male parent, the embryo and endosperm have identical alleles. Expression in the endosperm will not bias the result. If the trait is on the female parent, an accurate result will be obtained if the gene is not expressed in the seed coat. If the gene is expressed in the seed coat, this will bias the result. In selfing species, when heterozygotes self, negatives will be missed. The analyst will have no idea that segregation is occurring for the trait in the population and a higher trait purity will be given than is actually there. It would be beneficial for third party labs to have access to gene expression information to determine the best method for trait testing.

Trait testing is complex with triple/quad stacks being common. It would be useful to test all traits from the same extract, however, some traits may or may not be expressed in the seed coat. This has implications for other testing methods such as event-specific or AP testing, marker-assisted selection and genetic purity.

Seed Production (B. Lang – Minnesota Crop Improvement): Minnesota Crop Improvement (www.mncia.org) was established in 1903. It is a non-profit organization with 575 program participants. It is a member of AOSCA and deals with seed certification and identity preservation. Seed certification is governed by the Federal Seed Act and the Minnesota Seed Law. AOSCA has seed certification for domestic sales and OECD seed certification for international seed movement. In Minnesota, 20 different crop species are certified which include cereal grains, soybeans, turf/forage grass, legumes and 39 native species. The objectives of seed quality are to maintain varietal identity, varietal purity, a high rate of viability and be free of other crop seeds, weed seeds, etc. For seed production, the appropriate planting stock must be utilized, i.e., must be of known identity, have a high level of purity and be produced under tightly controlled conditions. The land selected for production of seed should be a region adapted for the crop with appropriate soil type and the previous land use must be considered to avoid volunteers from previous crops. For corn, if the same endosperm type is to be planted, there is no restriction on the previous land use. If a different endosperm type is to be planted from previous year, then the land cannot be used. For perennial crops, there is a 5 year restriction for foundation class and 1-3 year restriction for other classes. Isolation

distance is determined based on pollen characteristics and dispersal method. For self-pollinated crops (soybean, cereals), 5-10 feet of isolation is sufficient. For wind-pollinated corn, 660 feet is needed but this can be reduced if border rows are used. Grasses require 165 feet isolation and sunflowers require 1 mile. Harvest of seed is determined by moisture levels—corn is harvested at relatively high moisture content in the seed whereas cereal grains are harvested when seed moisture is quite low. Harvesting equipment is customized for the seed production and conveyance systems used to minimize mechanical damage.

ASTA Quality Assurance Manual (J. Stautz – Dow AgroSciences): ASTA was founded in 1883 and is celebrating its 125th anniversary this year. There are 750+ members in North America and they represent diverse sectors of the seed industry. The mission of ASTA is to advocate for the development, marketing and free movement of seed.

Seed quality management is fundamental to customer trust. Maintaining a seed variety's trueness to type is critical for market acceptance. Quality management cuts across all seed types. Quality management practices encompasses the management of all key process variables, establishment of consistent outputs and meeting customer expectations. There is general guidance for the development of a quality management program and guidance for maintaining seed product integrity and purity. The scope of the guidance is for the movement of seed to incorporate the trait into the breeding program and to maintain product integrity and purity of both biotech-derived seed and conventional seed. The guide is organized to accommodate different seed business models and practices. Sections can be utilized as applicable in seed product life cycle. The guide follows general quality management principles. Each stage of the life cycle has standard set of information: step-wise guide for developing quality management practices; follows principles of HACCP; and basic set of information applicable to most seed development and commercialization. The information set includes a) analysis of product integrity/control concerns; b) determination of control points; c) establishment of preventative measures; d) establishment of monitoring procedures; e) establishment of corrective measures; f) establishment of verification procedures; and g) establishment of recordkeeping, documentation. There is an interactive format on the website at www.amseed.org/seedquality. Information can be downloaded in PDF and saved.

MEMBER PROFILE

SGS-MidWest Seeds (K. Brix-Davis): SGS has 53,000 employees—14,000 in North America. The company was found in 1878 and deals in agriculture, automotive, consumer testing, environment, government/institutions, industrial, life science, minerals, oil, gas and chemicals, systems and services certification.

SGS acquired MidWest Seeds (MWS) and Alvey Ag. In 2007. MWS is part of the Seed and Crop Services Group which includes R&D, production, sales and field aspects.

SGS has 11 labs globally (2 in the U.S.) that perform DNA testing. SGS handles 800 field trials globally and also performs soil sampling/testing. Field demonstration centers handle grower interface, sales messages, etc. as well as efficacy, IRM, audit trials and

perform nematode studies. SGS also does seed inspection and fumigation as well as seed sampling, seed testing, contract seed research studies and monitoring services.

Applied Biosystems (M. Malkovich/D. McAllister): Applied Biosystems started with protein sequencing and has moved on to DNA sequencing. It was founded in 1981 and currently has 5000 employees. It is based in Foster City, CA and generates revenue of \$2.2 billion. Applied Biosystems serves research, pharma, applied markets and ag biotech with instruments and consumables and software. There are four business divisions: molecular/cellular biology, protein/small molecules, applied markets (human ID) and global services. The fundamental technologies are amplification of DNA/RNA, labeling of DNA/RNA with fluorescent dye, separation and detection. The company also has tools for genotyping and gene expression applications, thermocyclers and real-time tools. The future vision is the merger with Invitrogen which brings the reagents to go with Applied Biosystems' instruments and to bring safer food and water through accurate testing.

Seed Corn Conditioning Facility Tour (G. Clapper): The bus departed Embassy Suites approximately 8:30 am for the Remington Seed LLC (Hastings, MN) tour. We were introduced to our guide, Jim "Fuzzy" Monteith, on the bus and then visited some of the production fields to see how and where the corn is grown.

Background information on Remington Seeds LLC:

Committed to providing the highest level of quality and service; custom packaging; capable of fulfilling both high and low volume requirements; uncompromising confidentiality; inventory management; regional warehousing and distribution; and most importantly, they do not have a retail market. Remington does not own any of the land, but contracts with local farmers to produce the seed corn. This allows the flexibility needed regarding not planting corn-on corn as well as maintaining the distance between the seed fields and other crops that might cross-pollinate. Buffer rows are mandatory and other distances are in affect based on contract specifications.

AEIC members were able to see examples of the buffer rows, the planting of 1 male row followed by 4 female rows, repeat. At times they have used helicopters to facilitate pollination. The male rows are destroyed after pollination. Migrant workers and a local population of Hmongs do the rouging and detasseling. The corn should be harvested at 35% moisture to minimize damage during transport and processing. This location will process 300,000 bags of seed corn total this year.

Members watched semi-trucks deliver the seed corn, on the ear with husk, and the process for dumping the corn into the receiving pit. Then the seed is transferred by belt to the shakers. These machines shake and roll the corn to remove the husks from the ear. Next, the ears travel by belt to the sorting area. Three to four people (predominantly migrant workers and Hmongs) watch each machine to remove ears that still have husk attached. These are returned to the shakers for another round of removal. After sorting,

the ears are transferred by belt to the drying bins. From the drying bins the ears are transferred by belt to a shelling/sizing machine and then to dedicated bin storage until bagging. An automatic sampler draws the material for testing before the seed is delivered to the storage bin. The sample is used for various seed tests. It is important to verify the seed before it is treated and bagged to insure that extra costs are not incurred for treatment if the seed is not correct. If the seed is untreated, some input cost can be returned by selling the seed as grain at a local elevator. Once treated, the seed cannot be used for feed or food purposes.

Interesting note: They do not use NIR to measure moisture. There are no supported calibrations for moisture at the 35 % and higher range. Therefore, they use a Brown-Duvel Moisture Tester, manufactured by Seedburo. It uses the distillation principal to determine moisture in grains in approximately 20-30 minutes. It was originally developed by the USDA and has been calibrated against the official air oven method.

150 mLs of vegetable oil are mixed with approximately 100 grams of corn. The moisture is "cooked" off by heating the oil. The moisture is collected in a graduated cylinder and the moisture level is read from the cylinder. This is the ideal procedure for use with high moisture or frozen grains.