



115th MBAA Convention

Program Book



October 18-20, 2002



Austin, Texas



115th MBAA Convention

*Cover photos Sixth Street in Austin, Spicy Foods, Night Skyline of Austin by J. Griffis Smith.
All cover photos courtesy of the Austin Convention and Visitors Bureau.*

Table of Contents

MBAA Information 4
Hours 6
Schedule..... 9
Technical Program..... 10
Poster Program..... 13
Abstracts 14
Exhibition..... 54
Advertiser Index..... 58
Hyatt Regency Austin Floor Plan 60

MBAA Information

MBAA National Executive Committee

President	Kathy Kinton, <i>Miller Brewing Co., Irwindale, CA</i>
First Vice-President	Frank Kirner, <i>Anheuser-Busch Inc., St. Louis, MO</i>
Second Vice-President	Inge Russell, <i>Russell and Associates, London, Ontario, Canada</i>
Past President	Jim Steer (<i>Retired</i>), <i>Molson Canada, Etobicoke, ON, Canada</i>
Secretary/Treasurer	Gary Luther, <i>Luther Consulting, Hartland, WI</i>
Technical Director	Ray Klimovitz, <i>Klimovitz Brewing Consultants, Inc., Chippewa Falls, WI</i>

District Texas Officers

District Board of Governors	
Representative	Joseph W. Caracausa, <i>Miller Brewing Co., Fort Worth, TX</i>
District President	Jaime Jurado, <i>The Gambrinus Company, San Antonio, TX</i>
District Vice President	
& Technical Chair	Paul Lee, <i>Miller Brewing Co., Fort Worth, TX</i>
District Secretary/Treasurer	Joseph W. Caracausa, <i>Miller Brewing Co., Fort Worth, TX</i>
District Conference Director	Michele Amsterdam, <i>Miller Brewing Co., Fort Worth, TX</i>

115th Convention Planning Team

Co-Chairs: Michele Amsterdam, *Miller Brewing Co., Fort Worth, TX*
James Joseph Zamrazil, *Anheuser-Busch Inc., Houston, TX*

General Planning Committee

James G. Duca, *Ondeo Nalco, Houston, TX*
William Jones, *Miller Brewing Co., Fort Worth, TX*
Jaime Jurado, *The Gambrinus Company, San Antonio, TX*
Mary Thompson, *North By Northwest Restaurant and Brewery, Austin, TX*

MBAA Technical Committee

Technical Committee Chairperson

Finn B. Knudsen, *Beverage Consult International, Inc., Evergreen, CO*

Technical Committee Members

Barry Axcell, *South African Breweries Ltd., Sandton, Republic of South Africa*
Thomas A. de Man, *Heineken International Beheer BV, Zoeterwoude, Netherlands*
Alejandro Fierros, *Grupo Modelo, S.A. de C.V., Mexico City, Mexico*
John Harris, *Full Sail Brewing Co., Portland, OR*
Hans Herrmann, *Transmark LLC, Moscow, Russia*
Katia Jorge, *CPDTec Brewtech, Rio de Janeiro, Brazil*
Terry Kavanagh, *Carlton and United Breweries Ltd., Melbourne, Australia*
William Ladish, *Cargill Malt, Jefferson, WI*
Jim Murray, *Brewing Research International, Surrey, United Kingdom*
Motoo Ohkochi, *Kirin Brewery Co., Ltd., Yokohama, Japan*
George Reisch, *Anheuser-Busch, Inc., St. Louis, MO*
Inge Russell, *Russell and Associates, London, Ontario, Canada*
Gil Sanchez, *Miller Brewing Co., Milwaukee, WI*
Antolin Sierra Benavides, *Cerveceria Cuauhtemoc Moctezuma, Monterrey, Mexico*
John Stanek, *BetzDearborn, Hernando Beach, FL*
Mike Sutton, *Coors Brewing Co., Memphis, TN*
Joaquin Tresselt, *Cerveceria Polar CA, Caracas, Venezuela*



Briggs of Burton

**CAN BUILD YOU A FULLY-INTEGRATED BREWERY SYSTEM...
... ANYWHERE IN THE WORLD**

At Briggs, we provide the key products, integrated systems, total project management and turnkey design/build services for the international brewing industry. With an extensive staff of highly-qualified and experienced engineers, we are equipped to provide pure design, engineering and manufacturing facilities, or mastermind a complete operation on a greenfield or brownfield site, anywhere in the world.

Our innovative manufacturing technology, multi-disciplinary engineering skills, commitment to technical excellence, combined with total reliability, comprehensive support systems and vast resources are sought and valued by important companies around the world.

For an up-date on everything we can do to serve the global brewing industry, please contact us via one of the methods below.



BRIGGS

Briggs of Burton Inc., 5 Marway Circle, Rochester NY 14624, USA
Phone: 1 585 426 2460 Fax: 1 585 426 0250 e-mail: sales@briggsusa.com, www.briggsusa.com

BRIGGS OF BURTON IS REPRESENTED WORLDWIDE THROUGH OFFICES AND AGENCIES IN EUROPE, THE AMERICAS, INDIA, RUSSIA, CHINA AND AFRICA

Hours

Registration

Big Bend Foyer

Friday, October 18 8:00 a.m. – 6:00 p.m.
Saturday, October 19 8:00 a.m. – 6:00 p.m.
Sunday, October 20 9:00 a.m. – 4:00 p.m.

Posters

Texas Ballroom IV-VII

Friday, October 18 2:00 – 5:00 p.m. Set Up
Saturday, October 19 8:00 a.m. – 4:00 p.m.
(authors present 9:30 – 10:30 a.m.)
Sunday, October 20 9:00 a.m. – 3:00 p.m.
(authors present 10:30 – 11:30 a.m.)
3:00 - 4:00 p.m. Take Down

Exhibition and Lunch

Longhorn Corral

Saturday, October 19 8:00 a.m. – Noon Set Up
Noon – 2:00 p.m.
Sunday, October 20 11:30 a.m. – 1:30 p.m.
1:30 – 3:30 p.m. Take Down

Bierstube

Big Bend A-D

Friday, October 18 10:00 a.m. – 6:00 p.m.
Saturday, October 19 10:00 a.m. – Midnight
Sunday, October 20 Noon – 6:00 p.m.

Speaker Ready Room

Padre Island

Friday, October 18 Noon – 6:00 p.m.
Saturday, October 19 7:00 a.m. – 5:00 p.m.
Sunday, October 20 8:00 a.m. – 4:00 p.m.

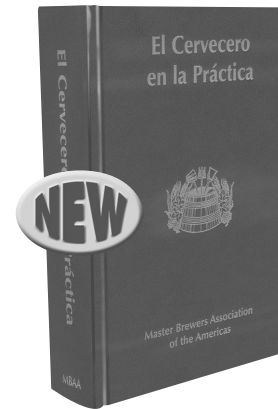
Women Brewers – *You're Invited*

Ladies, join Kathy Kinton, MBAA President, for some friendly conversation and networking before the Saturday night pub crawl. The first ever MBAA Women in Brewing Networking Social will take place on October 19 at the Hyatt's Branchwater Lounge from 5:00 to 6:00 p.m.

SAVE \$50

When you buy at the MBAA Convention!

¡Una Célebre y Renombrada Referencia Cervecera, Ahora Disponible en Español!



© 2002; 6" x 9" pasta dura;
840 páginas; 82 tablas; 313 Ilustraciones & Figuras

Convention SALE Price \$125

Regular Price \$175

The popular *Practical Brewer, Third Edition* is now available in Spanish! Written by industry experts, this valuable reference is regarded as an outstanding basic training tool in the art and science of brewing.

Capítulos

Historia Mundial Cervecera y su Desarrollo en las Américas; Agua; Cebada y Malteo; Adjuntos; Producción de Mosto; Composición del Mosto; Cocción del Mosto; Lúpulo; Enfriamiento del Lúpulo; Fermentación, Principios y Prácticas; Levadura – Cepas y su Manejo; Operaciones en Cavas; Envasado – Botellas; Llenado – Barriles; Calidad de la Cerveza y Métodos Sensoriales; Control Estadístico de Procesos en la Cervecería; Interpretación de Resultados de Laboratorio; Servicios de Ingeniería; Limpieza y Saneamiento; Sistemas de Control; Instrumentación; Cerveza de Baja Calorías; “Cervezas” No Alcohólicas y de Bajo Contenido de Alcohol; Temas Ambientales Afectando Operaciones Cerveceras; Técnicas Cerveceras Artesanas. Incluye los siguientes apéndices: Terminología Internacional para Pruebas de Degustación Cervecera, Tablas de Bengtsson, Tabla de Kramer, Metricación; Índice.



#M7792-8/02

MBAA 2002 Convention

**MBAA extends its sincere appreciation to the following organizations
for their generous contributions to the MBAA 2002 Convention:**

**Anheuser-Busch Inc.
BASF Corp.
Cargill Malt
domnick hunter
GenPrime, Inc.
Miller Brewing Company
Owens-Illinois Glass Containers
Rahr Malting
Spoetzl Brewery
World Minerals, Inc.**

Polyclar[®] Brewbrite[™]

- Reduced astringency
- Increased shelf-life
- Increased wort clarity
- Increased wort production
- Decreased fermentation time
- Increased profitability



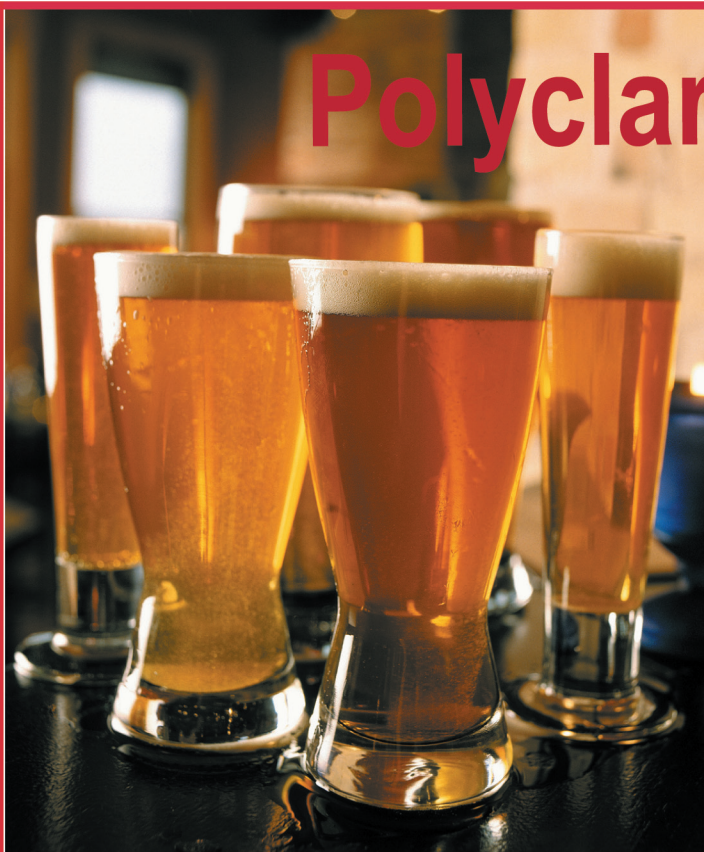
International Specialty Products, 1361 Alps Road, Wayne, NJ 07470

To find out more about how ISP can assist you, give us call.

In the Americas: (800) 522-4423, In Europe: +44 1737 377000,

In Asia: +65 223 3778

Or visit our web site at [Http://www.ispcorp.com](http://www.ispcorp.com)



Schedule

Friday, October 18

8:00 a.m. - 6:00 p.m. Registration
 9:00 - 11:00 a.m. Technical Committee Meeting
 9:00 - 11:00 a.m. *Technical Quarterly* Editorial Committee Meeting
 10:00 a.m. - 6:00 p.m. Bierstube
 11:00 a.m. - 4:00 p.m. Board of Governors Meeting
 Noon - 6:00 p.m. Speaker Ready Room
 1:00 - 5:00 p.m. MBAA/ASBC-Sponsored Workshop: Beer Flavor Defects:
 Origins and Troubleshooting
 2:00 - 5:00 p.m. Poster Set Up. Gil Sanchez, Moderator
 5:00 - 6:00 p.m. First-Timers' Orientation
 6:00 - 10:00 p.m. President's Night Dinner

Big Bend Foyer
 Hill Country AB
 Hill Country C
 Big Bend A-D
 Foothills II
 Padre Island

Hill Country ABC
 Texas Ballroom V-VII
 Foothills I
 Texas Ballroom I-IV

Saturday, October 19

7:00 - 7:45 a.m. Presenters' Breakfast
 7:00 a.m. - 5:00 p.m. Speaker Ready Room
 8:00 - 9:15 a.m. Guest Breakfast
 8:00 a.m. - 12:00 p.m. Exhibitor Set Up
 8:00 a.m. - 4:00 p.m. Posters Available for Viewing
 8:00 a.m. - 6:00 p.m. Registration
 8:00 - 8:05 a.m. Opening of Technical Sessions - Finn Knudsen, Technical Program Chair
 8:05 - 9:30 a.m. **Technical Session I – Thomas A. de Man, Moderator (Papers 1-3)**
 9:30 - 10:30 a.m. Poster Session - authors at their posters. Gil Sanchez, Moderator
 9:30 a.m. - 12:00 p.m. Biosecurity Session, Jack Hoffbuhr, Speaker – Ray Klimovitz, Moderator
 9:30 a.m. - 3:00 p.m. Guest History Tour and Lunch at the Historic Driskill Hotel
 10:00 - Midnight Bierstube
 10:30 a.m. - 12:00 p.m. **Technical Session II – George Reisch, Moderator (Papers 4-6)**
 10:30 a.m. - 12:00 p.m. **Technical Session III – William Ladish, Moderator (Papers 7-9)**
 Noon - 2:00 p.m. Exhibits and Lunch
 2:00 - 3:55 p.m. **Technical Session IV – Joaquin Tresselt, Moderator (Papers 10-13)**
 2:00 - 3:55 p.m. **Technical Session V – John Harris, Moderator (Papers 14-17)**
 2:00 - 4:00 p.m. Sanitation Session – Peter Koestler, Moderator
 5:00 - 6:00 p.m. Women in Brewing Networking Social
 6:00 - Midnight Pub Crawl

Foothills I
 Padre Island
 Foothills II
 Longhorn Corral
 Texas Ballroom IV-VII
 Big Bend Foyer
 Texas Ballroom I-III
 Texas Ballroom I-III
 Texas Ballroom IV-VII
 Hill Country ABC
 Offsite
 Big Bend A-D
 Texas Ballroom I
 Texas Ballroom II, III
 Longhorn Corral
 Texas Ballroom I
 Texas Ballroom II, III
 Hill Country ABC
 Branchwater Lounge
 Offsite

Sunday, October 20

8:00 - 8:45 a.m. Presenters' Breakfast
 8:00 - 9:00 a.m. Past Presidents' Breakfast
 8:00 a.m. - 4:00 p.m. Speaker Ready Room
 9:00 - 10:30 a.m. **Technical Session VI – Mike Sutton, Moderator (Papers 18-20)**
 9:00 - 10:30 a.m. **Technical Session VII – Antolin Sierra Benavides, Moderator (Papers 21-23)**
 9:00 a.m. - 3:00 p.m. Posters Available for Viewing
 9:00 a.m. - 4:00 p.m. Registration
 10:30 - 11:30 a.m. Poster Session - authors at their posters. Inge Russell, Moderator
 11:00 a.m. - 1:30 p.m. Guest Champagne Brunch and Cooking Demonstration
 11:30 a.m. - 1:30 p.m. Exhibits and Lunch
 Noon - 6:00 p.m. Bierstube
 1:30 - 3:25 p.m. **Technical Session VIII – Barry Axcell, Moderator (Papers 24-27)**
 1:30 - 3:05 p.m. **Technical Session IX – Terry Kavanagh, Moderator (Papers 28-30)**
 1:30 - 3:30 p.m. Exhibitor Take Down
 3:00 - 4:00 p.m. Poster Take Down
 3:50 - 4:15 p.m. **Technical Session X – Finn Knudsen, Moderator (Paper 31)**
MBAA Award of Merit Lecture
 6:30 - 10:30 p.m. Installation of Officers and Awards Dinner

Foothills I
 Board Room
 Padre Island
 Texas Ballroom I

Texas Ballroom II, III
 Texas Ballroom IV-VII
 Big Bend Foyer
 Texas Ballroom IV-VII
 Foothills II
 Longhorn Corral
 Big Bend A-D
 Texas Ballroom I
 Texas Ballroom II, III
 Longhorn Corral
 Texas Ballroom IV-VII

Texas Ballroom I-III
 Texas Ballroom I-IV

Monday, October 21

8:00 a.m. - 5:00 p.m. Post-Convention Workshop – Microsoft Excel for Brewers
 8:30 a.m. - 3:30 p.m. Owens-Illinois Tour
 8:30 a.m. - 4:30 p.m. Spoetzl Brewery Tour

Offsite
 Offsite
 Offsite

Technical Program

Saturday, October 19

Technical Session I

8:05 – 9:30 a.m.

Texas Ballroom I-III

Moderator: Thomas A. de Man, *Heineken International Beheer BV, Zoeterwoude, Netherlands*

- 8:05 **I-01.** The Introduction, Distribution, and Improvement of Malting Barley in North America. *Scott Heisel, American Malting Barley Association, Inc., Milwaukee, WI. Co-Author: M.P. Davis*
- 8:30 **I-02.** Following Flavour Development During the Roasting of Cereals. *Catharine O'Shaughnessy, Brewing Research International, Nutfield, Surrey, UK. Co-Authors: G.S. Chandra (presenter), P.T. Robbins, P.J. Fryer, B.L. Wedzicha*
- 8:55 **I-03.** Flavor Characteristics of Liquid Adjuncts Derived from Corn. *Scott Helstad, Cargill, Inc. North America Sweeteners, Dayton, OH. Co-Authors: J. Friedrich, J. Cox*

Poster Session

9:30 – 10:30 a.m. (Authors present at their posters)

Texas Ballroom IV-VII

Moderator: Gil Sanchez, *Miller Brewing Co., Milwaukee, WI*

Technical Session II

10:30 a.m. – Noon

Texas Ballroom I

Moderator: George Reisch, *Anheuser-Busch Inc., St. Louis, MO*

- 10:30 **II-04.** New Canning Line in Suntory Kyoto Brewery with Advanced Technology. *Masaaki Fujiwara, Suntory Limited, Osaka, Japan. Co-Authors: Kenju Nagaoka, Masamichi Takabayashi, Takashi Suganuma, Hiroshi Ikeda*
- 10:55 **II-05.** Evaluating Barrier Enhancing and Scavenger Technologies for Plastic Beer Bottles. *Nick Huige, NICO Consulting, Waukesha, WI*
- 11:20 **II-06.** Plastic Barrier Beer Bottles: Where Are We Now? *Nina Goodrich, Amcor PET Packaging Americas, Mississauga, Ontario, Canada*

Technical Session III

10:30 a.m. – Noon

Texas Ballroom II and III

Moderator: William Ladish, *Cargill Malt, Jefferson, WI*

- 10:30 **III-07.** Investigation of Kilning Conditions for Reducing Nonenal Level in Malt. *Tsutomu Ueda, Asahi Breweries, Ltd., Brewing R&D Laboratory, Moriya-Shi Ibaraki, Japan. Co-Authors: H. Itagaki, K. Sasaki, K. Inomoto, M. Wakaura, K. Shibata, and K. Kawatsura*
- 10:55 **III-08.** Starch in Brewing: A Review. *Charles Bamforth, University of California, Department of Food Science & Technology, Davis, CA*
- 11:20 **III-09.** Effects of Barley Protein Content on Barley Endosperm Texture, Processing Condition Requirements, and Malt and Beer Quality. *Richard Leach, Canadian Malting Barley Technical Centre, Winnipeg, Manitoba, Canada. Co-Authors: Y. Li, M. Edney, M. Izydorczyk, A. Egi, K. Sawatzky*

Technical Session IV

2:00 – 3:55 p.m.

Texas Ballroom I

Moderator: Joaquin Tresselt, *Cerveceria Polar CA, Caracas, Venezuela*

- 2:00 **IV-10.** Multiple Variables that Support Beer Foam. *Michael J. Lewis, University of California, Department of Food Science and Technology, Davis, CA. Co-Author: Ashton S. Lewis*
- 2:25 **IV-11.** Concept of a Foam Analysis System Using Machine Vision Technologies. *André Nothaft, BrewTech Serviços Ltda., Rio de Janeiro, Rj, Brazil. Co-Author: Kátia Jorge*
- 2:50 **IV-12.** Enzymes that Transform Linoleic Acid into Di- and Trihydroxyoctadecenoic Acids in Malt. *Hisao Kuroda, Sapporo Breweries Ltd., Yaizu Shizuoka, Japan. Co-Authors: H. Maeba, M. Takashio*

- 3:15 **IV-13.** The Impact of a Novel Mixed Peroxid-Based Sanitizer on Beer – A Sensorial and Colloidal Evaluation. *Isabel Vasconcelos, Ecolab Quimica Ltda., Sao Paulo, Brazil. Co-Authors: L.A. Grab, K. Jorge, S.V. Marinho, G.H.P. Miranda, A. Nothhaft, B. Schmidt*

Technical Session V

2:00 – 3:55 p.m.

Texas Ballroom II and III

Moderator: John Harris, *Full Sail Brewing Co., Portland, OR*

- 2:00 **V-14.** Alternative Markets for Brewers Spent Grains. *Paul Bruijn, Heineken Technical Services, Zoeterwoude, Netherlands. Co-Authors: T.R. Noordman, E. Kruithof, S. Grass*
- 2:25 **V-15.** Reproduction of Ancient Egyptian Beer from the Old Kingdom Era. *Hideto Ishida, Kirin Brewery Co., Chuo-ku Tokyo, Japan*
- 2:50 **V-16.** Technical Musings and Applications of a Classical Brewer. *Gary Luther, Luther Consulting, Hartland, WI. Co-Author: Dr. F. Kuehtreiber*
- 3:15 **V-17.** Prohibition - Persistent Challenge. *Charles E. Lieberman, Retired Master Brewer, Allentown, PA*

Technical Session VI

9:00 – 10:30 a.m.

Texas Ballroom I

Moderator: Mike Sutton, *Coors Brewing Co., Memphis, TN*

- 9:00 **VI-18.** Evaporating the Myths of the Past. *John Andrews, Briggs of Burton plc, Burton-on-Trent Staffordshire, UK. Co-Author: B.C. Axcell*
- 9:25 **VI-19.** A Study of Wort Pressure Boiling Using a Mixture Design Method to Optimize DMS and 2-Furfural Wort Levels. *Robert T. Foster II, Coors Brewing Company, Golden, CO. Co-Author: E.J. Samp*
- 9:50 **VI-20.** Dynamic Wort Boiling. *Rudolf Michel, Heinrich Huppmann GmbH, Kitzingen, Bavaria, Germany. Co-Author: B. Vollhals*

Technical Session VII

9:00 – 10:30 a.m.

Texas Ballroom II and III

Moderator: Antolin Sierra Benavides, *Cerveceria Cuauhtemoc Moctezuma, Monterrey, Mexico*

- 9:00 **VII-21.** An Alternative Way of Beer Filtration. *Rik Schuurman, NORIT Process Technology B.V., Hengelo, Netherlands*
- 9:25 **VII-22.** The Impact of Diatomite Filter Aid on Beer Flavor. *George Christoferson, World Minerals Inc., Lompoc, CA*
- 9:50 **VII-23.** Beer Polypeptides and Their Selective Removal with Silica Gels. *Graham Stewart, International Centre for Brewing and Distilling, Heriot-Watt University, Edinburgh, Scotland, UK. Co-Authors: K. Leiper, I.P. McKeown*

Poster Session

10:30 – 11:30 a.m. (Authors present at their posters)

Texas Ballroom IV-VII

Moderator: Inge Russell, *Russell and Associates, London, Ontario, Canada*

Technical Session VIII

1:30 – 3:25 p.m.

Texas Ballroom I

Moderator: Barry Axcell, *South African Breweries Ltd., Sandton, Republic of South Africa*

- 1:30 **VIII-24.** Yeast Propagation and Storage Design for High Gravity Brewing (HGB). *M. Cholerton, Scandi Brew, Alfa Laval Copenhagen A/S, Søborg, Denmark*
- 1:55 **VIII-25.** The Role of the Membrane in Predicting Yeast Quality. *Sylvie Van Zandycke, Smart Brewing Services, Oxford Brookes Enterprises, School of BMS, Oxford, UK. Co-Authors: R. Siddique, O. Simal, and K.A. Smart*

- 2:20 **VIII-26.** New Applications and Methods Utilizing RF Impedance Measurements for Improving Yeast Management in a Modern Brewery. *John Carvell, Aber Instruments LTD, Aberystwyth Ceredigion, UK. Co-Author: K. Turner*
- 2:45 **VIII-27.** Accelerated Production of Lager Beer Using Ale Yeast. *Jean-Pierre Dufour, University of Otago, Department of Food Science, Dunedin, New Zealand. Co-Author: R. Keast*

Technical Session IX

1:30 – 3:05 p.m.
Texas Ballroom II and III

Moderator: Terry Kavanagh, *Carlton and United Breweries Ltd., Melbourne, Australia*

- 1:30 **IX-28.** Energy Saving with the New Style Refrigerating Machine. *Noubuo Hirano, Sapporo Breweries Ltd., Shibuya-ku Tokyo, Japan*
- 1:55 **IX-29.** Integrated Commercial and Technical Activities to Leverage Packaging Material Supply Chain Performance. *Desire Vermeulen, South African Breweries, Johannesburg, South Africa. Co-Author: C. Swart*
- 2:20 **IX-30.** Spontaneous Combustion of Hops, Fire Loss Prevention and Implications for Hop Quality. *David Hysert, John I. Haas, Inc., Yakima, WA. Co-Authors: J.A. White Jr., B.R. Cuzzillo, S.W. Garden, and A.W. Barth*

Technical Session X

3:50 – 4:15 p.m.
Texas Ballroom I - III

Moderator: Finn Knudsen, *Beverage Consult International Inc., Evergreen, CO*

- 3:50 **X-31.** MBAA Award of Merit Lecture: The “New Biotechnology” and Brewing. *Inge Russell, Russell and Associates, London, Ontario, Canada*

If you are serious about brewing science then leave nothing to chance

Support the MBAA scholarship program by making a donation at the registration booth. Your generous donation will help provide financial support and professional encouragement to achieving students in the field of brewing science. Everyone who donates \$50 or more during this year’s convention will be entered into a drawing to win one of 3 \$100 MBAA gift certificates or a complimentary registration to the 2003 MBAA Annual Convention along with 3 nights lodging.



Poster Program

Posters on display in Texas Ballroom IV-VII during the following hours:

Saturday, October 19 8:00 a.m. – 4:00 p.m., Authors Present 9:30 – 10:30 a.m.

Sunday, October 20 9:00 a.m. – 3:00 p.m., Authors Present 10:30 – 11:30 a.m.

Moderator: Gil Sanchez, *Miller Brewing Co., Milwaukee, WI*

Moderator: Inge Russell, *Russell and Associates, London, Ontario, Canada*

- P1.** Regenerable Combined Stabilization System. *Axel Jany, Handtmann Armaturenfabrik GmbH, Biberach, Germany. Co-Author: M. Katzke*
- P2.** A Novel Stabilization of Beer. *Mustafa Rehmanji, ISP, Wayne, NJ. Co-Authors: C. Gopal, A. Mola*
- P3.** Identification, Cause and Prevention of Musty Off-Flavours in Beer. *Michael McGarrity, Labatt Brewing Company, London, Ontario, Canada. Co-Authors: C. McRoberts, M. Fitzpatrick*
- P4.** The Relative Significance of Enzymic and Non-Enzymic Oxidation in the Mash. *Bill Stephenson, University of California, Department of Food Science & Technology, Davis, CA. Co-Author: C.W. Bamforth*
- P5.** Methyl Thioacetate and Other Sulfur Volatiles in Beer. *Evan Miracle, University of California, Department of Food Science & Technology, Davis, CA. Co-Author: C.W. Bamforth*
- P6.** Modelling the Small Scale Production of Speciality Malts. *Phillip Robbins, University of Birmingham, Centre for Formulation Engineering, Birmingham, West Midlands, UK. Co-Authors: P.J. Fryer, B. Wedzicha, E. Trauth, C. O'Shaughnessy*
- P7.** Standard Beer Flavor Method: An Instrumental Approach. *Lawrence Nielsen, Microanalytics, Round Rock, TX. Co-Authors: D.K. Eaton, D.W. Wright*
- P8.** Carbon Dioxide Fixation Technology from Brewery Processing Wastes. *Yutaka Mitani, Sapporo Breweries Ltd., Yaizu Shizuoka, Japan. Co-Authors: T. Yoshida, S. Kato, T. Choso, M. Ota, Y. Kise, S. Yagihashi, M. Takashio*
- P9.** Vitaltitration, a New Method for Assessment of Yeast Vitality Status. *Pedro Rodrigues, Faculty of Science, University of Porto, Porto, Portugal. Co-Authors: A.A. Barros, J.A. Rodrigues, A.A. Ferreira, C. Gonçalves, J.R.M. Hammond*
- P10.** Sensory and Analytical Characterization of Non-Volatile Taste Active Compounds in Bottom Fermented Beers. *Christina Schoenberger, Lehrstuhl für Technologie der Brauerei, Weihenstephan, Freising, Bavaria, Germany. Co-Authors: M. Krottenthaler, W. Back*
- P11.** A Vitality-Oriented Yeast Management in Suntory Kyoto Brewery with Recent Technology. *Atsushi Fujita, Suntory Ltd., Kyoto, Japan*
- P12.** Membrane Filtration for Bright Beer: An Alternative to Kieselguhr. *Reinoud Noordman, Heineken Technical Services, Netherlands. Co-Authors: C.J. Peet, J.H. Mensink, L. Broens, A. Mepschen*
- P13.** Practical Application of Multivariate Statistical Analysis for Evaluation of Sensory and Process Data from Full Scale Production. *Olav Vind Larsen, Alfred Jorgensen Laboratory Ltd., Frederiksberg, Copenhagen, Denmark. Co-Authors: A.C. Lillelund, S. Aastrup, D. Byrne, and I. Williams*
- P14.** pH Dependence of Radical Scavenging Activity of Polyphenols, Phenolic Acids and Sulfite. *Takashi Nakamura, Kirin Brewery Co., Ltd., Yokohama Kanagawa, Japan. Co-Authors: O. Franz, W. Back*
- P15.** A Comparison of the Selective Removal of Beer Polyphenols by Lucilite TR and PVPP from All Malt Lager. *Ian McKeown, Ineos Silicas, Warrington, England. Co-Authors: M. Thompson, G.G. Stewart*
- P16.** Development and Demonstration of Polymerase Chain Reaction Based Methods for Process Control in Brewing Industry. *Andreas Brandl, Institute for Brewing Technology II, TUM Weihenstephan, Freising, Bavaria, Germany. Co-Authors: E. Geiger, G. Vogeser*
- P17.** Stability Index - A New Approach to Measure the Flavor Stability of Beer. *Oliver Franz, Technical University of Munich, Munich, Bavaria, Germany. Co-Author: W. Back*
- P18.** Use of Activated Carbon in Production of Malternatives. *Robert Potwora, NORIT Americas Inc., Pryor, OK*
- P19.** Brewers' Yeast Oxidoreductase with Activity on Maillard Reaction Intermediates of Beer. *Ivan Galindo-Castro, Empresas Polar, Caracas Miranda, Venezuela. Co-Authors: B. Sanchez, L. Reverol, A. Bravo, J.L. Ramirez, R. Rangel-Aldao*
- P20.** Immunoassay Detection of Beer-Spoilage *Pediococcus* Spp. Utilizing a Novel Approach to Separate Bacterial Bound and Unbound Antibodies. *Kelly Tretter, Coors Brewing Company, Golden, CO. Co-Authors: G. Quest, T. Dowgiert, B. Ziola*

Abstracts

Technical Session I

Saturday, October 19

8:05 – 9:30 a.m.

Texas Ballroom I-III

Moderator: Thomas A. de Man, *Heineken International Beheer BV, Zoeterwoude, Netherlands*

Ir. Thomas A. de Man, born in 1948, graduated in 1971 from the Agricultural University, Wageningen, Netherlands, with food technology as his specialisation. He joined Heineken Breweries in the same year. The first four years were spent with the Dutch-based Heineken Technical Services Departments, with involvement in quality control of overseas breweries, new brewery projects, and an overhead value analysis exercise. Thereafter, he started his overseas career with the subsequent secondments: technological controller of Malayan Breweries Ltd. Singapore, brewery manager at Nigerian Breweries Ltd., and starting-up/control of license operations, group production manager, Dreher S.p.A. (Heineken Italy). Thomas returned to the Netherlands in 1986 to serve as regional technical manager for the Asia, Australia and Oceania region. In early 1991 he was nominated to corporate production policy and control director at Heineken International B.V.

I-01

The Introduction, Distribution, and Improvement of Malting Barley in North America

8:05-8:25 a.m.

Scott Heisel, *American Malting Barley Association, Inc., Milwaukee, WI*

Co-Author: M.P. Davis

The first documented introductions to the New World were made by the Spanish into Haiti in the waning years of the fifteenth century. Barley was grown at Martha's Vineyard in 1602 and in Champlain's Garden in 1610. Prior to the building of rail lines in the mid 1800s, significant barley production was limited to rural areas surrounding cities, ports, and navigable waterways. The movement of barley production has often been punctuated by events that have thrown both maltsters and brewers for a loop. Examples include the 1890 enactment of the McKinley Tariff that stopped the flow on Canadian barley to New York maltsters, prohibition, and *Fusarium* epidemics. The first major malting variety release in the U.S. was Manchuria in 1873 by the University of Wisconsin, Madison. The release of OAC 21 in Ontario in 1910 was the first major Canadian malting barley. Cross-breeding techniques were first applied to North American barley breeding programs in the early 1900s. Malting breeding programs are supported financially and through the coordination of quality evaluations by industry associations.

Scott E. Heisel is the vice-president and technical director of the American Malting Barley Association, Inc., Milwaukee, Wisconsin. He received a B.S. degree in biochemistry and a B.S. degree in agronomy from the University of Wisconsin, Madison, in 1982. In 1986 Scott received his M.S. degree in agronomy. He worked for several years at the USDA-ARS Barley and Malt Laboratory and has published several papers on characterizing various enzymes of germinated barley and the use of biochemical techniques to identify barley varieties. Scott joined AMBA in April of 1987. He is a member of ASBC, MBAA, and the American Association of Cereal Chemists.

I-02**Following Flavour Development During the Roasting of Cereals**

8:30 – 8:50 a.m.

Catharine O'Shaughnessy, *Brewing Research International, Nutfield, Surrey, UK*

Co-Authors: G.S. Chandra (presenter), P.J. Fryer, P.T. Robbins, and B.L. Wedzicha

Roasted products of barley, green malt and white kilned malts are important sources of flavour and colour to the food and beverage sector. Currently, control of the process is totally reliant on hand evaluation of colour during processing by artisan staff. As experienced operators retire and specifications become stricter, greater understanding of the process is required which will in turn lead to better control. At present, specifications of roasted products are simply extract colour, percentage extract, moisture, appearance and, in the case of crystal malt, the percentage of crystallisation. Production to a flavour specification, though desired by customers, is not yet possible. The work described here addresses this problem. Flavour development during roasting has been measured both analytically using chemical marker compounds representing the major groups of flavour active compounds and by flavour profiling using an expert taste panel. This has led to a better understanding of the physical processes and the patterns of colour and flavour development, together with their interactions, which take place during roasting.

Sachin Chandra graduated from India with a degree in chemistry and then studied for an M.Sc (Eng) in process biotechnology and a Ph.D at the University of Birmingham. This was followed by postdoctoral work on yeast flocculation at the University of Bath. Sachin joined BRI in 1992, working on a number of projects on raw material and beer quality. He developed a new light transmittance method to determine barley and malt homogeneity, sensory analysis of malt, and control of flavour during malting. As head of sensory and product quality programme, Sachin is working in the areas of beer flavour, flavour stability, and flavour chemistry.

I-03**Flavor Characteristics of Liquid Adjuncts Derived from Corn**

8:55 – 9:15 a.m.

Scott Helstad, *Cargill, Inc. North America Sweeteners, Dayton, OH*

Co-Authors: J. Friedrich and J. Cox

Liquid brewing adjuncts derived from corn are typically described as having a bland, semi-sweet flavor. However, other flavors are present. The intensity of these notes vary and are a function of the processing techniques used to make the syrup. This paper will present a fundamental overview of flavors commonly associated with corn-derived liquid adjuncts.

Scott Helstad works for Cargill, Inc. Sweeteners North America business unit as the national accounts technical services manager. Scott has been involved with the Technical Services Group since 1987, covering the western half of the U.S., before transferring to Dayton, OH. His areas of responsibility include servicing customer technical needs on the use of sweeteners in a variety of products and applications. Principle industries supported include brewing, confection, and baking. Prior positions held within Cargill include production shift manager, utilities shift supervisor and lab analyst. Before joining Cargill, Scott was involved with small-scale fuel ethanol production, completing work for both the United States Department of Energy and the Wisconsin Division of State Energy. Scott graduated from St. Olaf College in 1979 with a B.A. degree in chemistry. His memberships include MBAA, ASBC, AACT, IFT, and AACC. Scott resides with his wife, Lynn, and their two children in Centerville, OH. Other interests include singing, swimming, running, reading, woodworking, church and house repair/remodeling.

Panel Discussions

9:15 – 9:30 a.m.

Poster Session

9:30 – 10:30 a.m.

Texas Ballroom IV-VII

Moderator: Gil Sanchez, *Miller Brewing Co., Milwaukee, WI*

Notes**Technical Session II**

Saturday, October 19

10:30 a.m. – Noon

Texas Ballroom I

Moderator: George Reisch, *Anheuser-Busch Inc., St. Louis, MO*

George F. Reisch, a corporate brewing staff brewmaster in St. Louis, is a fifth generation brewmaster. His family owned and operated the Reisch Brewing Co. of Springfield, IL, from 1849 until it ceased operations in 1966. In 1966 George's father was hired by the Pabst Brewing Co. as a brewmaster at its Milwaukee, WI, brewery. George, an avid homebrewer during his high school and college years, attended the University of Wisconsin and worked during the summer months for both the Joseph Schlitz Brewing Co. as a brewery worker and at the Miller Brewing Co. as a research assistant. He tailored his course selection for a career in brewing and graduated in 1979 with a B.S. degree in food chemistry from the University of Wisconsin Department of Food Science and Technology. He was hired by Anheuser-Busch Inc. and was placed in their Corporate Management Training Program (1979–1980). In 1980 he was promoted to brewing supervisor and transferred to the Los Angeles Anheuser Busch brewery. At the Los Angeles brewery he also held the positions of brewing technical coordinator and assistant brewmaster before being moved into corporate brewing. George has taught a two-day brewing school to over 300 Los Angeles-based brewery employees, has conducted several "California Brewing Schools" for wholesaler and retailer personnel, taught the Budweiser Mobile Beer School at several locations throughout the country, and has hosted several "brewmaster dinners" in several cities around the U.S.. George is an active member of MBAA, past president of MBAA District Southern California, and is presently serving on the Membership, Marketing, and Technical committees for the national MBAA office. In addition, he is a member of the ASBC and the Board of Advisors for the North American Brewers Association. George's current duties include overseeing Budweiser production at four Labatt breweries in Canada. He is also involved in New Product Development, including the launch of new beer brands for Anheuser-Busch, which involves radio and TV appearances in the marketplace. George, his wife Kathy, and their four children live in Wildwood, MO.

II-04

New Canning Line in Suntory Kyoto Brewery with Advanced Technology

10:30 – 10:50 a.m.

Masaaki Fujiwara, *Suntory Limited, Osaka, Japan*

Co-Authors: Kenju Nagaoka, Masamichi Takabayashi, Takashi Suganuma, and Hiroshi Ikeda

At the Suntory Kyoto Brewery a new canning line with one hundred thousand cph capacity was started in 2001. For higher quality and efficiency we successfully introduced various innovative technologies into this line including: 1. Filling process design resulting in very low oxygen uptake. 2. New information system which supports accurate traceability and just-in-time trending analysis for a higher level of quality assurance. 3. Simple layout and robot technology which enables higher productivity. Initially in this paper, we will discuss beer quality and the assurance system that was greatly improved with the technological innovations. Next, we will discuss the technological factors that enabled high productivity with four operators per shift. Finally, we will present a computer-aided process information system used by the line operator. This changed their job style from machine operation to process improvement and preventing problems.

Masaaki Fujiwara is the deputy general manager in Suntory Engineering Department. He majored in mechanical engineering in Osaka University. After graduation in 1989, he joined Suntory Ltd. and has worked mainly in the engineering section of some plants and Suntory headquarters.

II-05

Evaluating Barrier Enhancing and Scavenger Technologies for Plastic Beer Bottles

10:55 – 11:15 a.m.

Nick Huige, *NICO Consulting, Waukesha, WI*

Interest in the use of plastic bottles for beer is growing. The use of oxygen and carbon dioxide barrier layers and coatings, and oxygen scavengers has made plastic an accepted packaging material choice for beer without having to compromise on quality. Besides the choice of barrier or scavenger for the bottle and the closure a brewer also has to choose between monolayer and multi-layer structures, internal and external coatings, bottle color, pasteurizability, recyclability and the use of PCR. This presentation will give advantages and potential disadvantages of various options and outline an approach on how to evaluate these options based on product and package quality requirements.

Nick Huige started his brewing career at Schlitz Brewing Company in 1972. In 1978 he joined Miller Brewing Company where he was manager of research engineering and packaging until his retirement in March 2002. He is currently involved in selected consulting assignments in the areas of new process technologies and plastic bottles. Nick has contributed to three books on brewing and has authored papers and patents in the areas of beer processing, beer flavor stability, byproducts, and plastic beer bottles. Nick, who was born in the Netherlands, obtained an M.S. degree from Northwestern University in the United States and a Ph.D. in chemical engineering from the Technical University of Eindhoven in the Netherlands. Nick is a member of MBAA, ASBC, and the Institute of Packaging Professionals.

II-06

Plastic Barrier Beer Bottles: Where Are We Now?

11:20 – 11:40 a.m.

Nina Goodrich, *Arcor PET Packaging Americas, Mississauga, Ontario, Canada*

Plastic barrier beer bottles for beer continue to improve in both price and performance. Technical solutions have come and gone contributing to the confusion for brewers around choosing the right barrier technology. What are the strengths and weaknesses of current options? What is next? Where does pasteurization fit for plastic bottles? What are the trade-offs between heat resistance and cost? Can it be done cost effectively? How many PU's are enough with plastic bottles? Recyclability, how important is it? This presentation will review the above questions and introduce Amcor's new monolayer scavenger bottle with enhanced carbon dioxide protection. The bottles can be pasteurized and are recyclable. The presentation will also review a novel non-destructive method for measuring all sources of oxygen ingress in plastic bottle systems.

Nina Goodrich is general manager of Amcor Center for Technologies in Mississauga, Ontario, Canada. Nina identifies and develops technologies and trends that will influence current and future packaging opportunities. Prior to her current position, Nina was the director of operations for the Guelph Food Technology Center, a food and packaging research organization in Guelph, Ontario; technical director for Magic Pantry Foods; and a senior consultant for the Technology Management Group of Pugh-Roberts Associates, a firm specializing in innovation and technology strategy. Nina has a degree in molecular biology from Wellesley College, has done graduate work in management, and is a frequent speaker at food and packaging industry events and conferences.

Panel Discussion

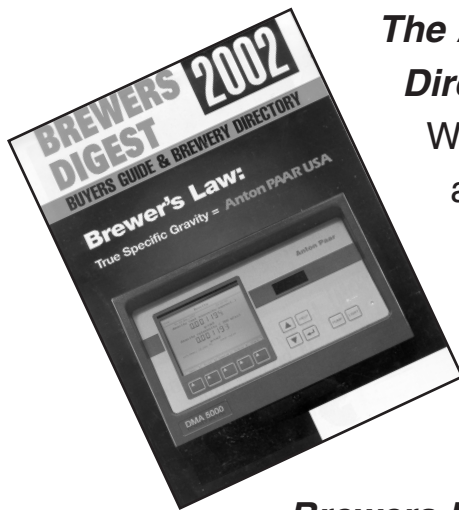
11:40 a.m. – Noon

Notes

Best Wishes to MBAA on a Successful
115th Anniversary Convention from

BREWERS DIGEST

Serving every segment of the brewing industry for 77 years.



The Annual Buyers Guide & Brewery Directory lists the breweries of the Western Hemisphere, suppliers, associations and U.S. importers. It is the most affordable and comprehensive directory published in the brewing industry, with updates in each issue of *Brewers Digest*.

Brewers Digest provides the most extensive coverage of the industry's conventions as well as beer shipment estimates, brewery promotional activities, business news, industry personnel changes, legislative updates, new products, services and literature, hop crop updates, dates for major conventions and events, beer festivals, local ASBC and MBAA meetings, state wholesaler association events and courses.

A subscription to **Brewers Digest**, including the **Annual Buyers Guide & Brewery Directory**, is only \$30.00 a year U.S. and \$40.00 outside the U.S. Subscribe now!

**Editorial/Advertising Sales and
Production Office:**
831 Anthony Rd.
Canutillo, TX 79835
Phone/Fax: (915) 877-3319
E-mail: Doribrew@aol.com

**Subscription Fulfillment
and Business Office:**
P.O. Box 677
Thiensville, WI 53092
Phone: (262) 242-6105
E-mail: bulletindigest@milwpc.com

Technical Session III

Saturday, October 19

10:30 a.m. – Noon

Texas Ballroom II and III

Moderator: William Ladish, *Cargill Malt, Jefferson, WI*

Bill Ladish received a B.S. degree in chemical engineering from the University of Wisconsin at Madison in 1972 and was awarded an M.B.A. degree from the Stanford University Graduate School of Business in 1974. Since that time he has held several technical and management positions in the malting business. He is currently technical services manager for Cargill Malt.

III-07

Investigation of Kilning Conditions for Reducing Nonenal Level in Malt

10:30 – 10:50 a.m.

Tsutomu Ueda, *Asahi Breweries, Ltd., Brewing R&D Laboratory, Moriya-Shi Ibaraki, Japan*

Co-Authors: H. Itagaki, K. Sasaki, K. Inomoto, M. Wakaura, K. Shibata, and K. Kawatsura

The kilning process is considered important for producing high quality malt. However, there have been few practical studies investigating the influences of kilning conditions on beer flavor stability. Therefore the effect of kilning conditions was examined by using two indicators, lipoxygenase (LOX) activity and malt trans-2-nonenal potential (M-T2N-P), a recently found indicator of nonenal formation in aged beer. In this study, we compared malt samples taken from top and bottom layer of the malt in a commercial double-floor kiln. Significant differences in LOX activity and M-T2N-P were found between these malt samples, suggesting that the temperature gradient in the malt layers caused the differences. This finding led us to investigate the effect of increasing kilning temperature. The micro-malting trials revealed the elevated final curing temperature effectively reduced LOX activity and M-T2N-P. Furthermore the commercial-scale studies showed the optimization of kilning temperature and duration enabled the considerable reduction in LOX activity and M-T2N-P without significantly changing other malt analyses. Taken together, we concluded that kilning conditions are potentially important factors for reducing T2N level in aged beer.

Tsutomu Ueda graduated from Osaka University in 1992, majoring in bioengineering. Since graduation he has worked in various positions for Asahi Breweries Ltd. From 1992 to 1995 he was assigned to the Mashing Section staff of the Fukushima brewery. During this time he worked on the development of the bottom-entry mashing-in system for improving beer flavor stability. That work was presented at the 26th EBC Congress (Maastricht, 1997). From 1995 to 1997 he worked as a malting supervisor at Asahi Beer Malt Ltd. In 1997 and 1998 he served as chief in the Quality Assurance Section of the Brewing R&D Lab. He spent 1999 as a visiting researcher at Brewing Research International in the UK. Upon returning to Japan he was appointed malt specialist in the Brewing R&D Lab. His primary areas of interest are the development of the new malt evaluation system and malting technologies for improving beer flavor stability. The new malt evaluation system was presented at the 28th EBC Congress (Budapest, 2001). Ueda is currently malting specialist and assistant section manager in the Brewing R&D Lab of Asahi Breweries Ltd.

III-08

Starch in Brewing: A Review

10:55 – 11:15 a.m.

Charles Bamforth, *University of California, Department of Food Science & Technology, Davis, CA*

The efficient degradation of starch during beer production involves some rather complex chemistry and biochemistry. In this presentation the chemistry of malt and adjunct starch structure, its impact on degradability, the role of different heating regimes in gelatinization and the susceptibility of the starch to attack by a range of enzymes will be reviewed. The current understanding of the enzymes from malt involved in starch hydrolysis will be reviewed.

Charlie Bamforth is the Anheuser-Busch Endowed Professor of Malting and Brewing Sciences at the University of California, Davis. He is a Fellow of the Institute and Guild of Brewing, a Fellow of the Institute of Biology and Editor-in-Chief of the Journal of the American Society of Brewing Chemists.

III-09

Effects of Barley Protein Content on Barley Endosperm Texture, Processing Condition Requirements, and Malt and Beer Quality

11:20 – 11:40 a.m.

Richard Leach, *Canadian Malting Barley Technical Centre, Winnipeg, Manitoba, Canada*

Co-Authors: Y. Li, M. Edney, M. Izydorczyk, A. Egi, and K. Sawatzky

Dry growing conditions on the Canadian prairies during the last few years, and especially in 2001, have resulted in malting barley with higher average protein levels. While Canada has a large pool of barley with protein in the traditional range of 11% to 12.5%, even in dry years, its pool of selectable malting barley could be expanded further, to meet the increasing world demand for malting barley, if it could be demonstrated that barley with higher protein levels could be processed without detrimental effects on malt and beer quality. In this study the malting performance of several Canadian malting barley varieties with protein contents up to 14.0% was evaluated. The effects of protein content on barley endosperm texture, water up-take, water distribution within the kernel, and the degree of modification were studied. In addition, the effects of barley protein content on wort composition, fermentability, and beer stability were also evaluated.

Dick Leach, a native of Montreal, has spent 35 years in the brewing industry. Shortly after graduating from McGill University he joined Molson Breweries, where he worked in various quality control, brewing, and plant management capacities in breweries in Montreal, Toronto, Regina, Calgary, and Barrie. His last assignment was as director of operations in Barrie for the year prior to its closing and his retirement from Molson in 2000. He is presently the managing director and manager of brewing technology of the Canadian Malting Barley Technical Centre in Winnipeg, Manitoba, Canada.

Panel Discussion

11:40 a.m. – Noon

Notes**Technical Session IV**

Saturday, October 19

2:00 – 3:55 p.m.

Texas Ballroom I

Moderator: Joaquin Tresselt, *Cerveceria Polar CA, Caracas, Venezuela*

Joaquin Tresselt graduated as master brewer from the Technical University Munich, Weihenstephan, Germany, in 1977. He has since been working at Cervecería Polar C.A., Venezuela, in different areas of Polar Breweries, including quality assurance, water treatment, in Cervecería Polar de Oriente, Barcelona; as head brewmaster in Cervecería Modelo, Maracaibo; as director of the Corporate Engineering Department; and since 1999 as the national corporate brewing manager of Polar Breweries.

IV-10

Multiple Variables that Support Beer Foam

2:00 – 2:20 p.m.

Michael J. Lewis, *University of California, Dept. of Food Science and Technology, Davis, CA*

Co-Author: Ashton S. Lewis

Research about beer foam takes one of two approaches: (1) the analysis of collapsed foam for foam-supporting materials, and (2) observing the effects of added materials. The properties and even identity of foam-supporting materials natural to beer can be predicted. The first approach leads to the concept of a singular foam-supporting protein, e.g. the barley lipid transfer protein, and the second approach, leads to the concept of a class of hydrophobic proteins. We suspected that foam is a multidimensional phenomenon that depends on the integrity of the product, and should be gauged with a natural pouring method. We selected thirty domestic beers, including low-alcohol products, premium lagers, calorie-reduced beers, super premium beers and ales, and specialty products from large and small producers. These beers were analyzed for foam stability (method of Mark Constants) and variables related to foam stability. Statistical correlations were then drawn between these analyses and foam stability. Our results do not directly contradict current theories but suggest that good foam arises from multiple, interacting and interdependent sources in beer.

Michael Lewis, a graduate of the University of Birmingham, England, recently retired from teaching, research and public service in the malting and brewing science program at the University of California, Davis. Many of his graduates are senior members of the American brewing industry, especially with the Anheuser-Busch Corporation. For this reason, the Anheuser-Busch Endowed Professorship in Brewing Science was recently established. Michael now concentrates his teaching efforts on University of California extension programs, especially the Master Brewers Program, which prepares candidates for the associate membership examination of the Institute and Guild of Brewing, and a specific university brewing qualification entitled the Professional Brewers Certificate Program. He has developed an online instructional program for distance learning leading to the Foundation Examination of the Institute and has written a second edition of his book Brewing with Dr. T.W. Young, which will appear shortly. Michael, a fellow of the Institute and Guild of Brewing and a member of ASBC and MBAA, received the MBAA Award of Merit. He served the university as assistant vice chancellor and associate dean and received the university's Distinguished Teaching Award in 1990.

IV-11

Concept of a Foam Analysis System Using Machine Vision Technologies

2:25 – 2:45 p.m.

André Nothaft, *BrewTech Serviços Ltda., Rio de Janeiro, RJ, Brazil*

Co-Author: Kátia Jorge

In the brewing industry, the quality of the foam created in a glass is of the most importance for the perception of the clients but it is also an indication of the quality of the beer. Even with the importance of foam appearance, to date measurement of foam characteristics at the laboratory level is still done with a fairly low level of information regarding foam quality. We are presenting a model that, using the actual level of machine vision technologies, will propose a new optic to the challenging field of foam analysis through the observation of the foam evolution at the bubble level. The model uses the potential of reading following foam parameters: foam collapse over time; mean bubble size over time; foam density over time; final liquid level and foam lacing, generating a matrix that will allow a comprehensive evaluation of the foam quality in beer.

Andre Nothaft is a brew engineer from Technical University Berlin in Germany with 20 years of brewing experience. Beginning his career at Cia Cervejaria Brahma as an apprentice, Andre went on to become R&D manager, where he was responsible for the idealization, planning, installation, and operation of Brahma's R&D center. Andre was involved in the formulation of several beers and charged with the management and development of a large number of soft drinks. He is partner at BrewTech, a service company that focuses on technological support and product development for breweries, the suppliers, and the craft-brewing segment, serving as general director.

IV-12

Enzymes that Transform Linoleic Acid into Di- and Trihydroxyoctadecenoic Acids in Malt

2:50 – 3:10 p.m.

Hisao Kuroda, *Sapporo Breweries Ltd., Yaizu Shizuoka, Japan*

Co-Authors: H. Maeba and M. Takashio

The qualities of beer are deteriorated by the presence of either di- or trihydroxyoctadecenoic acids, which reduce the beer 'head' and produce an astringent flavor. The content of these acids in beer could be controlled during mashing by raising mashing-in temperature, suggesting that enzymatic activities present in malt are involved in their production. We have reported that linoleic acid could be transformed into di- and trihydroxyoctadecenoic acids by malt extract (EBC2001). Lipoxygenase isozyme 1 (LOX-1) in malt produces linoleic acid hydroperoxides during mashing, and di- and trihydroxyoctadecenoic acids can be formed either enzymatically or non-enzymatically from linoleic acid hydroperoxide. Recent study revealed that LOX-1 was not able to transform linoleic acid into di- and trihydroxyoctadecenoic acids. Di- and trihydroxyoctadecenoic acids are generated from linoleic acid by both LOX-1 and a heat-stable enzymatic factor present in the malt (J. Biosci. Bioeng. 93:73-77, 2002). The mechanism underlying the production of these acids during mashing as well as practical applications for the improvement of beer quality will be discussed.

Hisao Kuroda is lead biochemist at Brewing Research Laboratories, Sapporo Breweries Ltd., in Shizuoka, Japan. Current research involves the analysis of lipid oxidation and beer quality, biochemical studies on malt enzymes. Specialities are genetic engineering, protein chemistry, and plant molecular biology.

IV-13

The Impact of a Novel Mixed Peracid-Based Sanitizer on Beer - A Sensorial and Colloidal Evaluation

3:15 – 3:35 p.m.

Isabel Vasconcelos, *Ecolab Quimica Ltda., Sao Paulo, Brazil*

Co-Authors: L.A. Grab, K. Jorge, S.V. Marinho, G.H.P. Miranda, A. Nothaft, and B. Schmidt

Mixed peracids represent the most recent advance in sanitizing technology for the brewery industry. The concentrate, based on a mixture of peracetic and peroxyoctanoic acids, a clear, colorless, and pungent-smelling liquid, manufactured by ECOLAB was submitted to BrewTech for evaluation. Pre-cleaned glass bottles and CIP cleaned stainless steel tanks were sanitized with the product at various use concentrations. After a fixed draining time and without a post-rinse step, the bottles and tanks were filled with Pilsener beer. The purpose of the work was to verify the impact of sanitizer residuals on the taste, appearance, foam, and cloudiness of the beer, under the worst case scenario (no post rinse) and over a concentration range of 0.05–1.0%. The analyses carried out were: foam according to NIBEM and modified Carlsberg Methods (Sigma value), cloudiness according to EBC and sensorial evaluation according to ASBC. Under regular sanitizer use concentration, no impact on the taste, foaming or cloudiness of the beer could be observed.

Isabel Vasconcelos has a Ph.D. degree in organic chemistry from the University of Missouri, St. Louis. She worked for four years at Ecolab Quimica in Brazil, where she held the positions of technical research manager and market development manager for the Food & Beverage Division, working on the introduction, structuring, and technical training of new programs and products for this area. Also, she worked for five years at the corporate quality control laboratory of Cia Cervejaria Brahma (currently AmBev). Isabel is now an independent consultant in the cleaning and sanitation area for the food and beverage industries.

Panel Discussion

3:35 – 3:55 p.m.

Notes**Technical Session V**

Saturday, October 19

2:00 – 3:55 p.m.

Texas Ballroom II and III

Moderator: John Harris, *Full Sail Brewing Co., Portland, OR*

John Harris, brewmaster at Full Sail Brewing Company in Portland, OR, has 15 years experience as a brewmaster of craft beers; two years with McMenamins Breweries, Portland OR, four years with Deschutes Brewery, Bend OR, and nine years with Full Sail. John has a dual role— he manages the Riverplace Brewery in Portland, which does all the research and development of new products, and is a emissary of beer education, traveling throughout the country teaching Full Sail distributors and retailers about its beers. John has been a member of MBAA since 1989 and is the current president of District Northwestern. John has been a member of the MBAA National Technical Committee since 1995. John is also a technical editor for the New Brewer magazine and a member of the National Craft Brewers Conference Technical Committee. In 2001 John was awarded the Institute for Brewing Studies Russell Scherer Award for Innovation in Craft Brewing. John has attended brewing classes at the University of California at Davis.

V-14**Alternative Markets for Brewers Spent Grains**

2:00 – 2:20 p.m.

Paul Bruijn, *Heineken Technical Services, Zoeterwoude, Netherlands*

Co-Authors: T.R. Noordman, E. Kruithof, and S. Grass

The preferred use for brewers spent grains is as feed for ruminants. However, for some Heineken breweries, it is not possible to feed the spent grains to ruminants. As a result, we have been seeking alternative uses for spent grains and other brewery by-products. In cooperation with 2B Biorefineries, a small Swiss company, we have been developing a process to separate the spent grains into a high protein fraction and a high fibre fraction. The high protein fraction is suitable for use as animal feed for pigs and poultry. The high fibre fraction is suitable for energy generation either by the brewery itself or by other energy producers. The energy produced is about 30 Mega-joules per hectolitre of beer produced, which is about 30% of the thermal energy needs of a modern brewery. The process is based on mechanical separations, uses proven equipment and is relatively flexible. Other brewery by-products such as surplus yeast, trub, malt dust and rest beer can be included in the process. Depending on local circumstances, the process is both economically viable and environmentally sustainable.

Paul J.M. Bruijn, born in 1961 in the Netherlands, graduated in 1983 as an engineer in mechanical engineering from the Hogere Technische School, Rijswijk, Netherlands. Thereafter he started at the University of Leiden and graduated in 1988 in biology with microbiology as his specialisation. He joined Heineken Technical Services in 1989. The first seven years he was a scientist in research and development, with byproducts, waste water technology, cleaning, and disinfecting as his main topics. Since 1996 he has worked as an environmental specialist at HTS Project Services. Paul's main projects include environmental reporting, training and workshops in water and waste water management, as well as research and operational support in by-product management.

V-15**Reproduction of Ancient Egyptian Beer from the Old Kingdom Era**

2:25 – 2:45 p.m.

Hideto Ishida, *Kirin Brewery Co., Chuo-ku Tokyo, Japan*

We have been studying the relief about beer brewing that was engraved on the tomb of Niankhkhnum and Khnumhotep from the Old Kingdom era in ancient Egypt. By examining each scene in the relief, we could find the similarity in their manufacturing method "Common Pathway" to those used in many folkloristic fermented foods in the present age. This made it possible to re-arrange and understand each scene. According to this hypothesis, we could reproduce ancient Egyptian beer from the Old Kingdom era. During reproduction, we found information that is useful in interpreting ancient Egyptian mural paintings and reliefs about beer brewing.

Hideto Ishida graduated from the Biochemistry Department at Kyushu University. He began working at Kirin Brewery Co. Ltd. in 1969 and has worked in quality control, brewing, malting, consumer research, reengineering, bottle making, technical information research, mini brewery construction, quality assurance reconstruction of a brewing plant at China, public relation in local plant, technical advising, and research of beer culture. In 2001 he was promoted to senior manager of the Technology Development Dept. at Kirin Brewery.

V-16**Technical Musings and Applications of a Classical Brewer**

2:50 – 3:10 p.m.

Gary Luther, *Luther Consulting, Hartland, WI*

Co-Author: Dr. F. Kuehtreiber

Dr. Franz Kuehtreiber, owner of the Hubertus Brau Brewery in Laa a.d. Thaya, Austria, is renowned in his geographic area for innovative, creative brewing solutions with regard to brewery equipment and technologies. This paper presents a number of Dr. Kuehtreiber's significant technological applications. Many today are considered leading edge with respect to beer flavor and beer flavor stability. Issues discussed include the coolship effect, krausen balls, hop powder, hot wort filtration, lauter tun run off as well as muses on yeast and trub management.

Gary Luther studied at the Technische Universitaet Muenchen, Weihenstephan, Germany, where he received a degree of engineer in brewing science and beverage technology. Gary joined the Antarctica Paulista Brewing Company, Sao Paulo, Brazil from 1973 to 1976. In 1976 he began employment with Miller Brewing Company. In January 2000 he retired from Miller as principal brewer. He now works to pass on to brewers the skills given to him through the years by his master brewer mentors. Gary is active in the MBAA, Verband ehemaliger Weihenstephaner, and Association of Brewers. He is also a member of the Deutsche Brau- und Malzmeister Bund and president of the Museum of Beer and Brewing, Inc. Gary has presented papers on numerous topics of practical brewing and brewing technology at MBAA and AOB meetings throughout the United States.

V-17**Prohibition - Persistent Challenge**

3:15 – 3:35 p.m.

Charles E. Lieberman, *Retired Master Brewer, Allentown, PA*

It pleases me to hear of the progress in those 10 mainly departmental responsibilities. A reoccurrence of prohibition (U.S.A. 1919–1933) is still a challenge that would affect everyone connected with the malt beverage industry. This talk will explain the complexity of the causes that led to the passing of the 18th Amendment in 1919; brewery activities; difficulties and shams in law enforcement, including some local and personal experiences; the debate over beverage intoxication limits; and President Roosevelt's April 1933 decree on 3.2% by wt. that preceded repeal in December of that year. Legalizing alcoholic beverages during the great depression (1930s) helped morale and provided jobs. In closing, suggestions will be made on how to mitigate public disapproval of malt beverages and government's proclivity toward making restrictive laws.

Biography not available.

Panel Discussion

3:35 – 3:55 p.m.

Notes**Technical Session VI**

Sunday, October 20

9:00 – 10:30 a.m.

Texas Ballroom I

Moderator: Mike Sutton, *Coors Brewing Co., Memphis, TN*

Mike Sutton, director of brewing operations and technology at the Coors Brewing Company Memphis brewery, is responsible for all brewing-related processing operations at the brewery, including brewing and bulk beer processing. He has held this position for the past four years, in addition to other responsibilities in powerhouse, environmental compliance, brewing lab, and plant quality system during three of the four years. Prior to joining Coors Brewing Company, Mike worked in the brewing industry for 17 years in various management operations and quality positions. These included three years with Froedtert Malt Corporation, Milwaukee, WI, as director of customer satisfaction/quality assurance, and 14 years with Miller Brewing Company, Albany, GA, & Ft. Worth, TX, in various brewing supervisory/management positions, including brewing manager. Mike is a 1992 graduate of the Diploma Program in Brewing Technology, Siebel Institute of Technology, Chicago, IL, and holds a B.S. degree in chemistry from Salisbury State University, Salisbury, MD. He has been a member of MBAA since 1985 and the MBAA National Technical Committee since 1997. He has been active as a member and/or officer in MBAA Districts' Southeastern, Milwaukee, and Texas.

VI-18

Evaporating the Myths of the Past

9:00 – 9:20 a.m.

John Andrews, *Briggs of Burton plc, Burton-on-Trent
Staffordshire, UK*

Co-Author: B.C. Axcell

Commercial beers (500–1500 hls) have been brewed, employing nucleate boiling, with kettle heater surface areas up to five times higher than the typical internal heater. This work was designed to establish the optimum kettle heater surface area that achieves the minimum evaporation compatible with required flavour and colloidal stability. Results demonstrate that nucleate boiling with a larger heater surface area can achieve major reductions in evaporation and energy consumption with no reduction in wort quality. This also allows a much lower steam/wort temperature difference, and the number of brews between heater CIP cleans can be increased from the normal 4–6 to greater than 30. Retrofitting this high surface area heating technology to existing kettles is straightforward.

John Andrews joined Briggs of Burton PLC in 1979. During the 1980s he led the rationalisation of the engineering supply base to the brewing industry in the English-speaking world, successively acquiring the brewing divisions of Pfaunder in the U.S., Balfour in Scotland, and RMDG in England. In 1987 he led the management buyout of Briggs and today is chairman and majority shareholder of the Briggs Group, employing 300 people on four continents. John has served on the Institute of Brewing Burton-on-Trent Section Committee since 1990 and was chairman in 1995–1996. He has presented papers on brewing technology at the IOB Asia Pacific and Africa Conventions, is a lecturer for the institute's associate, diploma, and international courses, and has published numerous papers in Ferment. He also lectures at the International Centre for Brewing and Distilling, Heriot-Watt University, Edinburgh, and at the Indian Brewing Technology Course in Mysore, India. He was elected a fellow of the institute in 1995. In 1997 he became chairman of the IOB Publications Committee and in 2000 was elected deputy president. Since 1998 he has also been a director of Brewing Research International. He served on the Amalgamation working party to merge the Institute of Brewing and the International Brewers Guild to form the Institute & Guild of Brewing (IGB) where he is a current member of council and was elected president in 2002.

VI-19

A Study of Wort Pressure Boiling Using a Mixture Design Method to Optimize DMS and 2-Furfural Wort Levels

9:25 – 9:45 a.m.

Robert T. Foster II, *Coors Brewing Company, Golden, CO*

Co-Author: E.J. Samp

In an effort to identify optimum kettle step boiling times for decreased wort dimethyl sulfide (DMS) levels, a mixture design was employed on three boiling process steps: pre-boil, pressure boil, and evaporation. Response Surface Methods were employed to characterize the effect of changes to these boiling process step times on wort DMS, 2-furfural, furfural, and 3-methyl-1-butanol levels. Significant effects were found for both DMS and 2-furfural (p -value < 0.10). To achieve the simultaneous optimization of both DMS reduction and control of scorching (2-furfural), a Weighted Composite Desirability Function (WCDF) was created to identify an optimal set of these three boiling process step times. With the optimal solution identified, the predicted average DMS level under these process step times was estimated to show a 78% improvement. A confirmation experiment running the boiling process under these identified optimal conditions yielded a 76% reduction in DMS and a 27% increase in 2-furfural levels. This study provides a framework for multiple response optimization as well as applying mixture designs to batch process steps.

Bob Foster received his B.S. in chemistry in 1972 from Rockhurst College in Kansas City, MO. Bob, who joined the Coors Brewing Company in 1974, has worked in brewing research and quality assurance, and is currently research associate in the Brewing Process R&D Department. During a two-year absence and as a full-time employee, Bob also received a Ph.D. in brewing in 1997 from Heriot-Watt University, Edinburgh, Scotland. Bob has been involved in hops, flavor stability, and brewing and packaging oxidation research. He is a member of ASBC, the Institute and Guild of Brewing – Scottish Section, and MBAA. Bob has published reports on hops and flavor research in the Journal of the American Society of Brewing Chemists, MBAA Technical Quarterly, and the Journal of Agricultural and Food Chemistry. Along with his Ph.D. thesis publication, Bob has a U.S. patent on a process for the isomerization of alpha acids. Recently, Bob received the 2002 Eric Kneen Award from the ASBC for his presentation at the 2000 World Brewing Congress.

VI-20

Dynamic Wort Boiling

9:50 – 10:10 a.m.

Rudolf Michel, *Heinrich Huppmann GmbH, Kitzingen, Bavaria, Germany*

Co-Author: B. Vollhals

Dynamic low pressure boiling for wort production has been introduced for several years in the brewing industry. Recent developments show very positive results in the behaviour of nitrogen compounds and flavour related indicators like DMS and TBF. With dynamic low pressure boiling in the modern application, very high product quality standards were achieved. At the same time evaporation figures were reduced to 4.0 to 5%. This means a high saving of primary energy during the boiling process. New designs of internal boiler were developed to allow such technological results. Various methods to avoid the “pulsing” of wort during heating up procedure are discussed. The poster will incorporate the latest results and experience from recent installations, showing that this proven technology provides superior product quality.

Rudolf Michel received his diploma engineering and doctor of engineering degrees from the Technical University of Munich at Weihenstephan. He was a member of the scientific staff at the Institute of Chemical Engineering at Weihenstephan, working on the mechanisms of hot break separation in a whirlpool tank and on hygienic design of armatures and pipework systems in food industry. Rudolf received his industrial experience with Ziemann as head of its R&D Department and with Kaspar Schulz. He joined Huppmann in 2000 as senior director brewing & technology and was involved in major brewing projects and research works around the world for Huppmann. He is a member of IGB and of DBMB and has published more than 50 papers.

Panel Discussion

10:10 – 10:30 a.m.

Notes

Technical Session VII

Sunday, October 20

9:00 – 10:30 a.m.

Texas Ballroom II and III

Moderator: Antolin Sierra Benavides, *Cerveceria Cuauhtemoc Moctezuma, Monterrey, Mexico*

J. Antolin Sierra B. was born in Monterrey, Mexico. He received a bachelors in chemistry from Instituto Tecnológico de Monterrey in 1969 and a Ph.D. in organic chemistry from the University of Detroit in 1975. Antolin joined Cerveceria Cuauhtemoc Moctezuma in 1975 as head of the quality control laboratory and has since held various positions in the areas of quality assurance, process development, and research. He is a member of MBAA and the American Society of Brewing Chemists (ASBC), and has served on the ASBC Editorial Committee, MBAA Technical Committee, and president of the MBAA District Mexico in 1986. His present position is director of research and development for Cerveceria Cuauhtemoc Moctezuma.

VII-21

An Alternative Way of Beer Filtration

9:00 – 9:20 a.m.

Rik Schuurman, *NORIT Process Technology B.V., Hengelo, Netherlands*

A new membrane filtration process has been developed in a joint research project by NORIT Process Technology, X-Flow, and Heineken Technical Services, The Netherlands. The process is based upon Cross Flow micro filtration, which in the past has been tried and tested many times, but has never been able to become a technically and economically feasible alternative to conventional kieselguhr filtration. This was mainly due to high fouling rates of the membranes, short run times and inadequate cleaning procedures. The new developed technology however, overcomes all the above mentioned barriers to successful commercial implementation of membrane filtration as alternative to kieselguhr filtration in breweries. The key to the feasibility of this new technology is a newly developed cleaning strategy and the excellent properties of the applied X-Flow membranes. The advance of production technology of X-flow permits membranes to be tailored to desired filtration results, necessary to develop a reliable filter and filtration process for any type of beer. As the beer membrane filtration system is fully automated, a continuous process is guaranteed. Filter aids, like diatomaceous earth, are no longer required. NORIT's Membrane filtration is now a very attractive alternative from an economical as well as a technological point of view. No filter aid is required and waste disposal is not an issue anymore. As kieselguhr is no longer required, no health risk is involved. It is modularly built and therefore easy to scale up and adapt to lower capacity for special beers, and low season production.

Rik Schuurman, senior process engineer/product manager at NORIT Process Technology B.V. since 1999, received his B.S. degree at the Technical School for Food Technology, Bolsward, Netherlands. Rik is currently responsible for process design and all projects related to process issues that involve the brewing process, from turnkey to those in the "cold block area." The past two years he has focused on process development of beer filtration with membranes. He previously served as technical sales manager (1997–1999) at Spoura S.A., Belgium, and as head brewer at Grolsche Bierbrouwerij BV, Netherlands (1986–1997). He has over 16 years experience in the brewing industry. As brewmaster he has been specialised in design, engineering, commissioning and start-up of all kinds of brewery systems.

VII-22

The Impact of Diatomite Filter Aid on Beer Flavor

9:25 – 9:45 a.m.

George Christoferson, *World Minerals Inc., Lompoc, CA*

Diatomaceous earth, also known as diatomite, or kieselguhr, has been used as a filter aid in the food processing industry since 1913. There are references to diatomite filter aid in the U.S. brewing industry as early as 1914. Its use was limited prior to prohibition because of concern for its affect on taste. Diatomaceous earth filter aids gained acceptance in the production of “near beer” during the prohibition years (1920–1933). Following the repeal of prohibition, the U.S. brewing industry expanded rapidly and with it high-speed production. Diatomite filtration provided a method of clarifying efficiency that other technologies did not. This paper follows the development of premium quality filter aids and their acceptance in the industry. As the market has moved toward light-bodied beers, attention to the influence of contact materials on flavor has received increased attention. The impact of beer soluble iron and other metals as well as how they are monitored and controlled will be discussed, as well as what new developments can be expected in the future.

George Christoferson received a B.S. degree from the University of Minnesota in 1967. He began his career with the Celite Corporation in January 1969 as a technical sales representative in the midwestern United States. In 1987 he was promoted to field sales manager. In 1989 George moved to the Lompoc, CA, headquarters of the Celite Corporation to become part of the Marketing and Technical Service Group. He is currently general manager of technical service for North America, providing support for the Celite Corporation and the Harbortrite Corporation, subsidiaries of World Minerals Inc.

VII-23

Beer Polypeptides and Their Selective Removal with Silica Gels

9:50 – 10:10 a.m.

Graham Stewart, *International Centre for Brewing and Distilling, Heriot-Watt University, Edinburgh, Scotland, UK*

Co-Authors: K. Leiper and I.P. McKeown

Beer contains between 300 and 800g/liters of protein depending on how it is brewed. This protein is in the form of polypeptides, the majority of which lie within the 10–40 kDa size range. Some of these polypeptides are responsible for causing colloidal haze, some provide foam stability and the remainder appear to have no function. The polypeptides responsible for haze formation are the ones that can combine with polyphenols to produce a visible cloudy haze. This is undesirable as it can determine the beer's shelf life. One way to reduce this effect is to remove these polypeptides using silica gels. It is important that this adsorption is selective and the desirable foaming polypeptides are not removed. Data will be presented to show that beer polypeptides are highly glycosylated and that silica preferentially adsorbs polypeptides rich in protein, and particularly those rich in the amino acid proline. The effect on foam polypeptides is minimal. The molecular sizes of haze, foam and the apparently functionless polypeptides will be presented.

Graham Stewart is the director and professor of the International Centre for Brewing and Distilling, Heriot-Watt University, Edinburgh, Scotland. He received his B.Sc. Hons in microbiology and biochemistry from the University of Wales at Cardiff and his Ph.D. and D.Sc. degrees from Bath University in the UK. He was a lecturer in biochemistry in the School of Pharmacy at Portsmouth College of Technology (now Portsmouth University) from 1967 to 1969. From 1969 to 1994 he held a number of technical positions with Labatt's in Canada and from 1986 to 1994 was director of brewing technical affairs for John Labatt Ltd. He became a member of the Institute of Brewing (now the Institute and Guild of Brewing) in 1969, was elected a fellow in 1987, and was the institute's president in 1999 and 2000. He is also a member of MBAA and ASBC. He holds fellowships in the Institute of Biology and the American Academy of Microbiology. He is a recipient of the MBAA Presidential Award (1983 and 1998) and Alltech Medal of Honour (2000). In addition to coauthoring and editing a number of books, he has published over 200 original papers, patents and reviews. He is the coeditor (with Dr. Inge Russell) of CRC's Critical Reviews in Biotechnology and is a member of the editorial board of a number of journals including the Journal of the Institute of Brewing, the Journal of American Society of Brewing Chemists, and the MBAA Technical Quarterly.

SAVE \$15 on TQ CD-Roms at the MBAA Convention



The *Technical Quarterly* CD-Rom is a fully-searchable, state-of-the-art CD-Rom that compiles all articles published in *Technical Quarterly* during a single year. Volume 38 covers all articles published in 2001. Volume 37 covers all articles published in 2000.

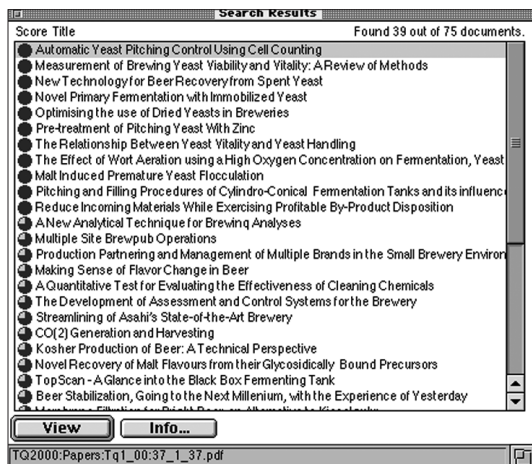
CD-Rom technology offers:

Convenience—rapid access to complete *Technical Quarterly* articles right from your computer

State-of-the-Art Searchability—link directly to articles or search the complete text within articles using basic or advanced techniques

Publication Quality—features high-quality graphics and photographs;

Compatibility—the CD-Roms are formatted with Adobe Acrobat software to allow use on all computer platforms including Macintosh and IBM compatible PCs. Every CD includes a copy of Adobe Acrobat Reader at no extra charge and no additional software is required.



Powerful search engine offers extended capabilities allowing you to make your search as general or customized as desired. Search results on the term "yeast" shown above.

SAVE \$15
When you buy at the MBAA Convention!

Regular Price \$55
Convention Price \$40
 Institutional Price \$295
 Local Area Network (serving up to 100 computers)



MASTER BREWERS ASSOCIATION
OF THE AMERICAS

Panel Discussion

10:10 – 10:30 a.m.

Poster Session

10:30 – 11:30 a.m.

Moderator: Inge Russell, *Russell and Associates, London, Ontario, Canada*

Notes**Technical Session VIII**

Sunday, October 20

1:30 – 3:25 p.m.

Texas Ballroom I

Moderator: Barry Axcell, *South African Breweries Ltd., Sandton, Republic of South Africa*

Barry Axcell, group chief brewer for the South African Breweries, is responsible for both brewing and R&D. He is a fellow of the Royal Society of Chemistry, the Institute of Biology, and Institute of Brewing; visiting professor in the Department of Microbiology at the University of Stellenbosch, and honorary research associate at the University of the Witwatersrand in South Africa. Barry was the first international director of the ASBC and has published over 70 papers on a wide range of brewing issues.

VIII-24

Yeast Propagation and Storage Design for High Gravity Brewing (HGB)

1:30 – 1:50 p.m.

Mike Cholerton, *Scandi Brew, Alfa Laval Copenhagen A/S, Søborg, Denmark*

With most breweries, now maximizing production from existing plant by HGB or VHGB this paper reflects on the considerations required in Yeast Plant Design to facilitate successful/consistent yeast performance in an increasingly aggressive environment. This environment can leave even the most resilient yeast more susceptible to infection, mutation and damage. Inhibiting growth factors, yeast stress, subsequent fermentation problems and some implications on beer flavour will be the key issues. With HGB resulting in yeast being used for fewer generations, developments in Yeast Propagation and Storage Design will be discussed. For Propagation, different systems will be described (single vessel/batch, 2 vessel/semi-continuous and continuous). Concerns that high cell growth/accelerated aeration has the potential to produce yeasts that are “stressed” and detrimental to fermentation performance will be raised. For Storage, an optimum Yeast Storage Tank Design to prevent yeast degeneration, incorporating the correct mixer specification/dimensioning, will be presented. New developments in Mixer designs for yeast will show “Flow Propeller” types allowing circulation from flow and not turbulence. The new type of design uses flow circulation reducing potential cell damage from turbulence caused behind the mixer blades. Also implications from tip speed; pumping and cooling rates will be discussed. Integrated Mixer/CIP systems that clean all the mixer parts, including behind the mixer blades would be included as well as implications from acid washing facilities.

Mike Cholerton, sales and technology manager for Scandi Brew, Alfa Laval Copenhagen, offers technical support on Scandi Brew business to the Alfa Laval UK, Africa, U.S. and Canada markets. He has worked in the Scandi Brew business for the past 10 years, concentrating on its yeast management and yeast plant design. Mike has also been involved in yeast management presentations to various MBAA and IOB symposiums and brewery groups worldwide. He works out of a home office and lives in the UK with his wife and 5-year-old son.

VIII-25

The Role of the Membrane in Predicting Yeast Quality

1:55 – 2:15 p.m.

Sylvie Van Zandycke, *Smart Brewing Services, Oxford Brookes Enterprises, School of BMS, Oxford, UK*

Co-Authors: R. Siddique, O. Simal, and K.A. Smart

Viability and vitality are common terms to describe yeast quality. Viability corresponds to the percentage of dead cells, whereas vitality represents the physiological state of the yeast. Viability is commonly assessed using methylene blue, which relies mainly on intracellular reduction within live cells to decolorize the dye molecule. However, methylene blue is inaccurate and subjective due to the occurrence of variable dye intensity. As a consequence, fluorescent dyes have been suggested as an alternative viability method due to their greater accuracy and consistent coloration. One candidate, oxonol, is an anionic dye excluded from live cells as a result of transmembrane potential. As a consequence, this dye represents a useful indicator of membrane integrity. Assessing yeast vitality requires the use of metabolic indicators. We have recently suggested that the acidification power test may be used to assess yeast physiological state and as a consequence may also predict fermentation performance. The assay is based on the ability of a yeast population to acidify the surrounding medium, and directly quantifies the extent of proton efflux. In this paper we demonstrate the potential of this assay to determine plasma membrane potential, H⁺-ATPase activity and membrane integrity. The acidification power test and fluorescent dyes are recommended for use in the determination of yeast quality.

*Sylvie Van Zandycke studied biochemical engineering and fermentation at the Institut Meurice, Brussels, Belgium, completing her degree in 1996. During that time she obtained an Erasmus studentship for a 6-month project on brewing yeast cell ageing at Oxford Brookes University. She obtained her Ph.D. on “The role of catalase and glutathione on replicative lifespan in *Saccharomyces cerevisiae*” in 2000 from Oxford Brookes University. Since March 2000 Sylvie has been employed as project manager for SMART Brewing Services at Oxford Brookes University. She is involved in contract research, microbiological analysis, and development of methods and kits for the brewing industry. Her main research interests include ageing in *Saccharomyces cerevisiae*, brewing microbiology and yeast quality.*

VIII-26

New Applications and Methods Utilizing RF Impedance Measurements for Improving Yeast Management in a Modern Brewery

2:20 – 2:40 p.m.

John Carvell, *Aber Instruments LTD, Aberystwyth Ceredigion, UK*

Co-Author: K. Turner

RF impedance or capacitance measurements are used in many of the larger automated breweries for measuring the viable yeast cell concentration. In this paper the latest applications are reported for the ways brewers are using this measurement in either the yeast pitching main, the yeast recovery line or the fermentation vessels. The new methods include an electrode that can be either inserted into a production propagator and fermenter or submerged into a vessel to monitor the yeast concentration profile in real time. The paper also describes how RF impedance can be combined with a bulk fluorescence measurement to allow both the live and dead cell counts to be determined.

John Carvell studied biochemistry at Bangor University (1976) and received a Ph.D. at the University of Newcastle, UK, in 1980. He has served as production manager at British Fermentation Products, UK, 1980–1985; senior product development engineer at APV Crawley, UK, 1985–1987; biotechnology sales manager, APV Baker, UK, 1987–1989; senior product manager, Alfa Laval, UK, 1989–1993; and sales and marketing director, Aber Instruments Ltd., UK, 1993–2001. He was presented with the Queens Award for Export in 1998 and has served as board member of Export Association (UK). John has been a member of ASBC since 1998 with poster presentations in 1998 and 1999. He is a member of SIM, IOB and MBAA with poster presentations at RAFT III in 1999 and IOB Asia Pacific Meetings in 1998 (Perth) and 2000 (Singapore) and EBC (Hungary) 2001. He has also made presentations to MBAA Canada in January 2000, MBAA Caribbean in April 2001, and MBAA California in June 2001.

VIII-27

Accelerated Production of Lager Beer Using Ale Yeast

2:45 – 3:05 p.m.

Jean-Pierre Dufour, *University of Otago, Department of Food Science, Dunedin, New Zealand*

Co-Author: R. Keast

Within the brewing process, much time is required for the steps of fermentation and maturation. Alteration of any fermentation/maturation parameter in order to achieve shortening of production time is only acceptable if no significant changes in beer quality are introduced. The most common way to accelerate the fermentation process is by using higher fermentation temperatures. Higher fermentation temperature, however, is known to alter levels of yeast-by products that make-up beer flavour. This work examines the production of beer main flavour compounds by lager and ale yeasts under identical conditions using 11 P lager wort. Increasing the fermentation temperature influenced the formation of aromatic alcohols to a higher extent than the aliphatic alcohols. The use of ale yeast, however, allowed a better control of the production of aromatic alcohols. Comparative analysis of lager and ale yeast amino acid metabolism indicated a reduced production rate of flavour for the ale yeast. Under all tested conditions, attenuation at 18 C was completed in 5–6 days with total VDK level lower than 80 ppb, with no VDK precursor detected.

Jean-Pierre Dufour received his M.Sc. in 1975 and Ph.D. in 1979 (Louvain). He was a research fellow at Johns Hopkins University, School of Medicine, Baltimore, MD, 1979–1981. His appointments include Catholic University of Louvain, professor, 1981–1993, serving as head of the Department of Brewery and Food Industries, 1987–1993; Universidade Catolica Portuguesa, Escola superior de Biotecnologia, Porto, Portugal, visiting professor, 1989–1994; University Senghor, Alexandria, Egypt, associated professor, 1992–1995; expert for EEC and UNIDO (implementation of sorghum malt for the production of lager beer in Africa), 1994–1996; University of Otago, Dunedin, New Zealand, professor (1995–present), chair and head of Department of Food Science. His expertise include flavour science, fermentation science and technology, malting and brewing sciences, and yeast biochemistry/enzymology. He is an active member of EBC Brewing Science Group, ASBC, IOB, Institute of Food Technology, American Chemical Society, and New Zealand Institute of Food Science and Technology. He has served as vice-president and fellow of the New Zealand Institute of Food Science and Technology and as New Zealand delegate to IUFoST.

Panel Discussion

3:05 – 3:25 p.m.

Notes**Technical Session IX**

Sunday, October 20

1:30 – 3:05 p.m.

Texas Ballroom II and III

Moderator: Terry Kavanagh, *Carlton and United Breweries Ltd., Melbourne, Australia*

Terry Kavanagh joined Carlton and United Breweries in 1970 with a Ph.D. in organic chemistry from the University of Melbourne and two years in food science at Pennsylvania State University where he worked on the flavour of both dairy products and chocolate. While his initial work was associated with beer flavour, he subsequently was responsible for all of the company's research activities. He was later responsible for technical services, co-ordinating both research and quality assurance. He currently works in CUB operations, with responsibility for national quality and regulatory affairs. He chairs the Australian Associated Brewer's Technical Committee and the Institute of Brewing (Asia Pacific) Editorial Committee, which assembles the technical programme for its biennial convention. He is a member of the MBAA Technical Committee.

IX-28**Energy Saving with the New-Style Refrigerating Machine**

1:30 – 1:50 p.m.

Nobuo Hirano, *Sapporo Breweries Ltd., Shibuya-ku Tokyo, Japan*

Sapporo Breweries in 2000 began operation of new refrigeration equipment which utilises the world's latest technology. Generating power below freezing point had been impossible until the "absorption system refrigerating machine," which uses water and lithium bromide as working media. The operation of this system, which is described in this presentation, also provides environmental benefits. Water and lithium bromide are considered to be safer than ammonia. Furthermore, unlike chlorofluorocarbons, there is no impact on the ozone layer. For these reasons, the refrigerating machine can be described as one which is designed to take the environment into consideration. Sapporo Breweries combines this refrigerating machine with co-generation and anaerobic waste water treatment systems. By these measures we have been able to maximise recycled energy regardless of the volume of steam on beer processing.

Nobuo Hirano is a research engineer in the Engineering Section of the Production and Technology Division of Sapporo Breweries Ltd., and is based at its head office in Tokyo, Japan. He graduated from Nihon University in 1992 and joined Sapporo Breweries Ltd. that same year. Since 1998 his responsibilities have been improvement of energy management and energy saving for each brewery.

IX-29**Integrated Commercial and Technical Activities to Leverage Packaging Material Supply Chain Performance**

1:55 – 2:15 p.m.

Desire Vermeulen, *South African Breweries, Johannesburg, South Africa*

Co-Author: Chris Swart

This paper covers the work being done by the South Africa Breweries to control and improve packaging material supplier performance and outgoing quality. The total commercial and technical interface with the packaging suppliers will be discussed, with the focus on packaging supplier accreditation, grid analysis, six sigma and the TCO concept (Total Cost of Ownership). Six Sigma is being used as a measurement tool as South African Breweries does not do incoming inspection on packaging raw materials. The success using the system will be highlighted. The commercial and technical interface is very important and formal procedures such as packaging supplier accreditation and grid analysis are used for risk assessment as well as supplier development.

Desire Vermeulen is currently working as a packaging consultant for South African Breweries in Johannesburg. Before joining SAB she was mainly involved in maintenance management and supplier development for Colgate-Palmolive Africa-Middle East Division after obtaining her mechanical engineering degree in 1992. SAB has a Supplier Partnering Program that aims at leveraging the potential of suppliers that supply strategic commodities to SAB in order to optimise total cost of ownership. Desire is also a lecturer at Pretoria University, lecturing in maintenance management and the influence of maintenance on product quality.

IX-30

Spontaneous Combustion of Hops, Fire Loss Prevention and Implications for Hop Quality

2:20 – 2:40 p.m.

David Hysert, *John I. Haas, Inc., Yakima, WA*

Co-Authors: J.A. White Jr., B.R. Cuzzillo, S.W. Garden, and A.W. Barth

Little is known about the causes and cures of the perennial hop industry problem, spontaneous combustion of hops. As a result of 3 catastrophic hop warehouse fires in 1999 and 2000, we investigated this problem intensively in 2001. Our laboratory and bale-scale studies of this problem were described previously (ASBC 2002 Annual Meeting). In addition to discovering and implementing the primary means for preventing spontaneous combustion of hops, we discovered that everything that reduces the risk of self-heating of hops also improves the quality of hops. Some of our most important conclusions from this work are: 1) Columbus is a variety with very high risk for self-heating; 2) low moisture (<8%) bales are more prone to self-heating than high moisture (>10%) bales; 3) hops kilned at >66°C are at higher risk of self-heating than hops kilned below that temperature; 4) improperly kilned and cooled hops prior to baling exhibited initial self-heating to potentially quality-damaging temperatures and then cooled. As a result of this work, we established stricter harvest specifications for hops, which have been included in our purchase contracts for 2002 crop hops. We anticipate that as a result of these changes we will not only lower our risk of self-heating of hops but also improve the quality.

David Hysert has been vice president, technical director for John I. Haas, Inc., in Yakima, WA, since 1992 and is responsible for R&D, technical services, and QA. Prior to joining Haas, he enjoyed an 18-year career at Molson Breweries of Canada where he held various positions in R&D, technical services, and QA, including vice-president, research and QA, 1985–1992. He received a Ph.D. from the University of Toronto in bioorganic chemistry in 1971. David is an active member of many professional societies including the MBAA, ASBC, and Institute and Guild of Brewing. He was president of the ASBC in 1998-1999.

Panel Discussion

2:40 – 3:05 p.m.

Notes

Technical Session X

Sunday, October 20

3:50 – 4:15 p.m.

Texas Ballroom I-III

Moderator: Finn Knudsen, *Beverage Consult International Inc., Evergreen, CO*

Finn B. Knudsen has more than 30 years experience working in the brewing and beverage industry from various management positions at Tuborg Breweries, Rainier Brewing Company, Molson Breweries of Canada, Danbrew Consult Ltd. (Carlsberg), Coors Brewing Company, and Pripps Breweries. Finn also has worked with several universities during his career, including giving lectures to graduate students in waste control at the University of Washington. In 1993 Finn founded and became president of Beverage Consult International, Inc., Colorado, providing management and technical services to the beverage industry worldwide. In 1995 he was also appointed the president for the newly established American Region, New Zealand Hop Marketing Board, supporting the sales and services of the New Zealand Hop Products primarily in the Americas. He is currently serving as chairman of the MBAA Technical Committee.

X-31

MBAA Award of Merit Lecture

The “New Biotechnology” and Brewing

3:50 – 4:15 p.m.

Inge Russell, *Russell and Associates, London, Ontario, Canada*

Some have called the “new biotechnology” the greatest advance of the century. Others label it the greatest threat of the century. How can one technology bring about such divergent views? What is currently happening in this controversial field? The latest medical and agricultural advances will be reviewed in the context of potential spin-off technologies for our industry. How will cloning and gene chip technologies change how we make and package beer? With the recent mapping of the rice genome, what are the implications of that work to other crops? Even products such as BioSteel (a technology based on the cloning of spider silk, and its subsequent production in the milk of transgenic goats to make a silk-like material so strong that it can stop a 747 plane) will affect our industry. Learn more about the “new biotechnology” as it pertains to the future of the brewing industry and why this is one controversial field you can’t afford to ignore.

Inge Russell received her B.Sc. from the University of Western Ontario and her Ph.D. and D.Sc. in yeast biochemistry from the University of Strathclyde, Scotland. Over the past 31 years she has held various roles at Labatt/Interbrew including research scientist, managing R&D, spearheading the innovation process within the breweries for plant employees, and most recently in marketing innovation. She is a fellow of a number of scientific societies and has published extensively in the field of yeast biotechnology. She is co-editor of the journal Critical Reviews in Biotechnology and in 2002 accepted the role of editor of the Journal of the Institute of Brewing. She is an adjunct professor in the Department of Chemical and Biochemical Engineering at the University of Western Ontario and is currently 2nd vice-president of the MBAA.

Closing of Technical Program

4:15 – 4:20 p.m.

Thank You

More than 75 volunteers make up the MBAA committees that tackle important issues, keep members informed, manage the details, and basically make things happen.

It's important work.

Sincere thanks to everyone whose given their time to make a difference in MBAA and the science of brewing! MBAA especially thanks the following 2002 committee chairs:

Bylaws Committee

James Diamantis, *DiverseyLever, Inc.*

The Communicator Editorial Committee

Jerry Hilton, *J.F. Hilton & Company*

TQ Editorial Board

Jaime Jurado, *The Gambrinus Company*

Education Committee

Gregory Casey, *Coors Brewing Company*

Long Range Planning Committee

James Steer, *Molson Breweries*

Membership Committee

Travis Audet, *Redhook Ale Brewery*

Nominating Committee

James Steer, *Molson Breweries*

Scholarship Committee

Joseph Weiss, *City Brewing Company*

Annual Convention Technical Committee

Finn Knudsen, *Beverage Consult Intl Inc.*

MBAA Website Committee

Ian Stanners

2002 Austin Convention Committee

Michele Amsterdam, *Miller Brewing Co.*

James Zamrazil, *Anheuser-Busch Inc.*

2003 Milwaukee Convention Committee

Jerry Hilton, *J.F. Hilton & Company*

In addition to the above committees, there are over 140 member volunteers that serve as a District Officer. A BIG thank you to those who keep MBAA strong on the District level.

Poster Program

Posters on display in Texas Ballroom IV-VII during the following hours:

Saturday, October 19 8:00 a.m. – 4:00 p.m.

Authors Present 9:30 – 10:30 a.m.

Sunday, October 20 9:00 a.m. – 3:00 p.m.

Authors Present 10:30 – 11:30 a.m.

Moderator: Gil Sanchez, *Miller Brewing Co., Milwaukee, WI*

Gil W. Sanchez started his brewing career at Miller Brewing Company in 1982 in the Research Engineering and Planning Group and is currently a senior research engineer. At Miller he has had various responsibilities in water treatment and purification, disinfection, carbon dioxide recovery and purification, pasteurizer operation, adsorption, flavor recovery, corrosion, new product development, filtration, membrane separation, flavor stability and product quality improvement. Gil has authored several papers and authored the water chapter in The Practical Brewer. He was also a co-author for the Sharps patent. Gil obtained his B.S. and M.S. degrees in chemical engineering from the Massachusetts Institute of Technology and the University of California at Berkeley, respectively. He is a member of the MBAA, American Institute of Chemical Engineers, and North American Membrane Society.

Moderator: Inge Russell, *Russell and Associates, London, Ontario, Canada*

Inge Russell received her B.Sc. degree from the University of Western Ontario and her Ph.D. and D.Sc. in yeast biochemistry from the University of Strathclyde, Scotland. Over the past 31 years she held various roles at Labatt/Interbrew including research scientist, managing R&D, spearheading the innovation process within the breweries for plant employees, and most recently in marketing innovation. She is a fellow of a number of scientific societies and has published extensively in the field of yeast biotechnology. She is co-editor of the journal Critical Reviews in Biotechnology and in 2002 took on the role of editor of the Journal of the Institute of Brewing. She is an adjunct professor in the Department of Chemical and Biochemical Engineering at the University of Western Ontario and is currently 2nd vice-president of MBAA.

Poster No. 1
Regenerable Combined Stabilization System

Axel Jany, *Handtmann Armaturenfabrik GmbH, Biberach, Germany*

Co-Author: Michael Katzke

The Handtmann Armaturenfabrik GmbH in Biberach, Germany developed a new beer stabilization system, called CSS Combined Stabilization System. The CSS is capable of a combined removal of turbidity forming protein and polyphenols in a single step. The CSS is a compact rig mounted fully automated stabilization system consisting of a stabilization chamber and regeneration and cleaning unit. It can be integrated into any existing or future filter line. The CSS stabilization chamber is completely filled with the CSS adsorbent, which is based on a high grade, cross linked insoluble agarose with a particle size between 100- 300 μ . The adsorbent is permanently retained, making the dosing of precoat and feed suspension prior to each filtration unnecessary. The basic principle of CSS is that haze precursors of protein and polyphenolic nature are adsorbed within seconds and then removed from the agarose during the regeneration with rock salt and caustic solution. The adsorbent remains in the chamber for several years neither losing its adsorbent activity nor creating much waste. With a consistent total flow rate, the desired stabilization grade is achieved by blending untreated beer (via bypass) automatically. Adjustments to accommodate changing conditions can be made easily, based on the data stored in the program. Neither substances are dissolved in the beer nor is the beer quality affected in a negative way. The beer's organoleptic properties, its foam stability, color and bitterness units remain unaltered. The paper will describe the CSS system, show the stability and cost results achieved by various breweries in Europe which conducted tests with the CSS 25 hl/h test unit and a 300 hl/h production scale system installed and in operation in St. Petersburg Russia since December 2001.

Axel Jany started his brewery career in 1987 in Germany as an apprentice brewer and maltster within the Holsten Brewery Group. After working as a brewer and studying at VLB/Technical University Berlin, he received his brew master degree in 1994. He joined the Handtmann Company as a filtration technician and presently holds the position of manager international sales. He has been a member of MBAA since 1995.

Poster No. 2
A Novel Stabilization of Beer

Mustafa Rehmanji, *ISP, Wayne NJ*

Co-Authors: Chandra Gopal, Andrew Mola

Stabilisation is an important stage in the production of beer, where an attractive appearance and flavour are considered key quality determinants. The methods adopted to achieve good colloidal stability have changed over time, reflecting both advances in brewing technology and a requirement to reduce production costs. Whilst current procedures usually concentrate on additions after fermentation – e.g. on transfer to maturation, or at filtration - little has recently been reported on colloidal stabilisation earlier in the brewing process. This paper describes a novel composite of Carrageenan and micronized PVPP, Polyclar Brewbrite, for use in beer stabilisation. A procedure for stabilizing beer in the brew-house is developed which can be adopted to simplify downstream processing and reduce cost. This could be adopted by smaller breweries or larger breweries or breweries in developing markets, to achieve good colloidal stability. Elsewhere, it could provide an additional mechanism to chill-proof 'difficult' beers in challenging environments. The benefits of this composite will be discussed and will include the following: (1) Improved compaction of whirlpool trub resulting in an increase in wort yield; (2) Carrageenan/micronized PVPP treated wort fermented better in terms of the drop in gravity as a function of fermentation time; (3) Improved filtration; (4) Improved beer haze and colloidal stability; (5) Improved yeast vitality and crop. Some of the advantages of this approach include a single addition of the stabilizer for complete stabilization of the beer requiring no specialized dedicated equipment for dosing the stabilizer into the beer.

Mustafa Rehmanji has over 20 years experience in malting and brewing industry. He is section manager, beverage products, research and development with International Specialty Products and his current interest is in beer stabilization and technical service for commercial treatment of beverages. Mustafa started his brewing career with Kenya Breweries. Later he moved to Canada and was director of technical service with Prairie Malt Limited. Mustafa holds a B.Sc. degree in chemistry and a business degree and diploma in brewing technology. He is an active member of ASBC and MBAA.

Poster No. 3**Identification, Cause and Prevention of Musty Off-Flavours in Beer**

Michael McGarrity, *Labatt Brewing Company, London Ontario, Canada*

Co-Authors: Chantelle McRoberts and Michael Fitzpatrick

Musty off-flavours in beer can result from contamination with geosmin, 2-methylisoborneol, 2-isopropyl-methoxypyrazine, 2-isobutyl-methoxypyrazine, 2,3,6-trichloroanisole, or 2,4,6-trichloroanisole, alone or in combination. Musties can be introduced via source water, raw materials, or alternatively, may be produced within the brewery. In response to a brewery's chronic, sporadic musty problems, a study was undertaken to identify and eliminate the source(s) of the musty off-flavours. In order to assess the plausibility of various vectors, sensory thresholds for the musty compounds were determined in beer. Remediation measures included improved practices pertaining to carbon filtration of the source water, CIP procedures, packaging conditions, raw material storage, as well as physical upgrades to the brewery ventilation and pasteurization systems. A monitoring program, involving sensory and instrumental analysis via a recently described method (ASBC, Victoria, June 2001), was implemented for the brewery. A literature review of musty off-flavours, beyond the context of beer and water, was also undertaken. As a result of these efforts, the problem appears to have been corrected. The resulting literature review and practical learnings, as well as threshold values will be shared.

Michael Jerome "Mick" McGarrity received his Ph.D. in physical organic chemistry at the University of Western Ontario in 1985, and was a member of the Natural Science and Engineering Research Council of Canada. Subsequently, he began studies at the Defense and Civil Institute of Environmental Medicine, Toronto, in 1984 and received his postdoctoral fellowship in applied biochemistry in 1986. Michael began working in the Research Department, Labatt Brewing Company Ltd., as a research scientist in 1986, advancing to section manager in 1988 and principal scientist in 1984, a position that he currently holds. His research interests include light stability, physical stability and flavour chemistry as it pertains to beer.

Poster No. 4**The Relative Significance of Enzymic and Non-Enzymic Oxidation in The Mash**

Bill Stephenson, *University of California, Dept. of Food Science & Technology, Davis CA*

Co-Author: C.W. Bamforth

Modern brewhouse designs stress minimum oxygen uptake in the belief that this improves the flavor life of beer. Oxygen in a mash certainly contributes to an increase in color, increase in turbidity, and slower wort separation because oxidation of polyphenols leads to their polymerization and cross-linking with protein. However the reason why oxidation in the mash may lead to flavor deterioration in the finished beer is by no means fully explained. Is it because the oxygen serves as a substrate for lipoxygenase, which then produces precursors of stale compounds? A kinetic investigation of this enzyme suggests that this may only be relevant at the point when grist and water are first mixed. Is it because the oxygen reacts with sulfhydryl groups in the grist proteins, to form hydrogen peroxide that oxidizes polyphenols non-enzymically but also enzymically, with the involvement of peroxidases? The kinetics of the latter enzymes certainly would be more in keeping with a sustained role in the mash tun. The attendant removal of polyphenols would diminish the anti-oxidant potential going through to the beer. In this study we have attempted to indicate the relative significance of non-enzymic and enzymic events in the mash. Amongst the investigational tools employed have been as a series of enzymic inhibitors, including nordihydroguaiaretic acid.

Bill Stephenson received his B.A. degree from Marquette University in Milwaukee, WI, in 1994 with a double major in economics and history. While in Milwaukee he acquired a taste for beer and a fascination with brewing, which led to several jobs in the industry after graduation. In early 1995 Bill was hired as a manager at Chicago Brew on Premise. Less than a year later he moved to Flatlanders Restaurant and Brewery in Lincolnshire, IL, and in 1997 Bill was hired as head brewer at Mickey Finn's Brewery in Libertyville, IL. In 2000 Bill began his master's degree in the Food Science Department at the University of California, Davis, working with Dr. Charlie Bamforth. In 2001 he accepted a position with Anheuser-Busch as a part-time brewing group manager at their Fairfield Brewery, where he has worked during the summer and on weekends while finishing his degree. Along with membership to the MBAA, Bill is an active member of ASBC and IFT, and an associate member of the Institute and Guild of Brewing, having passed the most recent sitting of the Associate Membership Examination.

Poster No. 5**Methyl Thioacetate and Other Sulfur Volatiles in Beer**

Evan Miracle, *University of California, Department of Food Science & Technology, Davis, CA*

Co-Author: C.W. Bamforth

Volatile sulfur compounds can have both desirable and undesirable impacts on beer flavor. Their presence at levels in the microgram/L and nanogram/L range presents a difficulty in developing a low cost reproducible method of laboratory detection. This study uses Solid Phase Micro Extraction (SPME) fibers as a concentration step for Headspace Gas Chromatography with a Sulfur Chemiluminescence Detector to provide the necessary sensitivity and precision without the use of purge and trap equipment. The SPME fiber was exposed to the sample headspace and then the accumulated sulfides injected directly onto the column. An internal standard, 1-propanethiol (1-PT) was used. This method showed reproducible sulfide detection for each compound tested at levels below the reported odor thresholds. Concentrations of methyl thioacetate (MeSAc), dimethyl sulfide, hydrogen sulfide, ethane thiol, ethyl methyl sulfide, diethyl sulfide and dimethyl disulfide were measured in a range of commercial beer samples. The levels of these compounds were also determined in commercial and laboratory wort samples. The production of (MeSAc) by various yeast strains was monitored during the course of laboratory fermentations under varied conditions of temperature, oxygen content, and starting gravity.

Evan Miracle received a B.S. degree in microbiology from the University of Georgia, Athens, in 1999. He is currently in the brewing program of the Food Science and Technology Graduate Group at the University of California, Davis, working toward a master's degree in food biochemistry. He is an associate member of the Institute and Guild of Brewing.

Poster No. 6**Modelling the Small Scale Production of Speciality Malts**

Phillip Robbins, *University of Birmingham, Centre for Formulation Engineering, Birmingham West Midlands UK*

Co-Authors: P.J. Fryer, B. Wedzicha, E. Trauth, and C. O'Shaughnessy

Production of speciality malts is currently an artisan process. As regulations and customer specifications become more precise, and experienced operators retire, a new approach to speciality malt production is required. To improve the quality and consistency of product greater understanding of the process is needed. To gain this understanding and enable automatic control methods to be implemented a model of the roasting process has been developed and tested on a spouted-bed roaster (500 g batch size) which provides grain of known temperature-time history. This model allows the average temperature and moisture content of the malt to be predicted throughout the roast time. This information together with expressions for colour and flavour development will enable changes in product characteristics to be modelled as a function of roasting control parameters such as temperature and time. It has been found that a zero-order model with an Arrhenius dependence on temperature for the colour development during crystal malt production gives a good agreement between predicted and measured colour.

Phillip Robbins is currently in his third year on a Ph.D. program at the Centre for Formulation Engineering, University of Birmingham, under the supervision of Prof. Peter Fryer. The Ph.D. is part of a Link scheme project (government and industry funded) on "A reaction engineering understanding of barley and malt roasting." During a pre-university year he worked on the heat treatment of milk looking at the fouling behaviour (unwanted surface deposits). Phillip received his undergraduate degree at Cambridge University. He spent his first two years in general engineering and his final two years specialising in chemical engineering. During the summer breaks Phillip worked for Unilever Research on two different projects, one on development of a fouling sensor and the other on micro-electrodes for sensing bubbles in food. Phillip conducted some mathematical modelling work on the thermal inactivation of bacteria in food while working on his Ph.D. project in Birmingham.



Membership in Master Brewers Association of the Americas Has Advantages!

MBAA membership offers a terrific opportunity to interact with other industry professionals, as well as gain practical solutions, resourceful safeguards and innovative technologies to strengthen your ability to succeed.

Join MBAA today and you will have the unique opportunity to:

- Receive complimentary subscriptions to *The MBAA Communicator* and *Technical Quarterly*
- Participate in District meetings and their technical conferences
- Attend the Annual MBAA Convention at the member rate
- Consult MBAA for technical support
- Save on MBAA books and CD-Roms
- Receive consultant referrals from MBAA
- Keep up-to-date through monthly member e-mail newsletters
- Network and share ideas with over 3,000 members worldwide
- Publish and present your research

Join by completing a membership application today!

Want to learn more about how MBAA can help you succeed?
Contact MBAA at +1.651.454.7250 or go online at www.mbaa.com.



Poster No. 7**Standard Beer Flavor Method: An Instrumental Approach**

Lawrence Nielsen, *Microanalytics, Round Rock, Texas*

Co-Authors: David K. Eaton, Donald W. Wright

A standard analytical method is described for evaluation of the volatile flavor compounds in beer. The method is performed on a single instrument and includes the following features: (1) SPME headspace collection under well-defined conditions. (2) GC separation using a tandem non-polar/polar column set. (3) Olfactometry characterization of flavor components and headspace aroma dilution analysis for aroma intensity quantitation. (4) Multidimensional GC to aid in aroma characterization. (5) One-to-one correlation of aroma and mass spectral for flavor component identification. (6) Quantitation of aromas with internal standards using full scan or SIM MS mode. Detected flavor compounds are characterized by flavor descriptors. These compounds individually contribute to the overall beer flavor to different degrees and it is this relative flavor contribution that the method measures. The described method is not intended to produce an accurate flavor profile in the sense that the correct proportion of the flavor components actually in the product is obtained. It does produce flavor profiles that have enough discrimination of flavor components to show differences between samples known to have different flavors.

Larry Nielsen joined Microanalytics, a company specializing in aroma, odor and flavor analysis, in 1999. During the last three years as scientist, he has been involved in the development of fast organoleptic analysis methodology for the food and packaging industries. Larry was previously with Corporate R&D of the Union Camp Corporation in Princeton, NJ, where he was a senior research scientist for 12 years working in the areas of organoleptic analysis and mass spectrometry. Prior to Union Camp, he worked for 15 years in Brazil as a research chemist at Rhodia and as a university teacher. Larry has B.S. and M.S. degrees in chemistry from Denver University.

Poster No. 8**Carbon Dioxide Fixation Technology from Brewery Processing Wastes**

Yutaka Mitani, *Sapporo Breweries Ltd., Yaizu Shizuoka, Japan*

Co-Authors: T. Yoshida, S. Kato, T. Choso, M. Ota, Y. Kise, S. Yagihashi, and M. Takashio

It is now known with certainty that the concentration of greenhouse effect gases in the atmosphere causes global warming. There are six main greenhouse gases, including, in particular, carbon dioxide. Greenhouse gas emissions are projected to significantly increase unless mitigating policies are implemented. In 1997, the Shimadzu Co. began to develop a newer technology for carbon dioxide fixation. This technology was directly aimed at reducing carbon dioxide gas. The Shimadzu Co. then developed a model in which bio-gas (mixture of methane and carbon dioxide) was changed into stable solid-carbon and water using catalytic reactions. Bio-gas is produced by the anaerobic digestion of biomass. Therefore, it also involved biomass recycling. The Shimadzu Co. and Sapporo Breweries, Ltd., have conducted a laboratory scale carbon dioxide fixation trial in the brewery since 1998. In the trial, the bio-gas was obtained from the brewery wastes. We found that the carbon dioxide fixation technology can be applicable for practical use. A part of this work was carried out cooperation with Research Institute of Innovative Technology for the Earth (Japan).

Yutaka Mitani joined Sapporo Breweries, Ltd., in 1984. He was engaged in biochemical and pharmaceutical research for 10 years. Since 1994 he has been involved in the R&D of biochemical engineering science at Sapporo's Brewing Research Laboratories (BRL), where he has been studying the hydrodynamics of brewing facilities, such as the wort boiling kettle and the whirlpool. He has also analyzed beer foam from the viewpoint of interfacial chemistry and transport phenomena. Yutaka is currently working in the field of environmental biochemical engineering and is the general manager of the Process Engineering Division of BRL. He received a Ph.D. from the Hiroshima University in 1984.

Poster No. 9**Vitaltitration, a New Method for Assessment of Yeast Vitality Status**

Pedro Rodrigues, *Faculty of Science University of Porto, Porto, Portugal*

Co-Authors: A.A. Barros, J.A. Rodrigues, A.A. Ferreira, C. Gonçalves, and J.R.M. Hammond

Fermentation performance and the quality and consistency of beer are affected by the yeast physiological status or vitality. Vitality tests can be useful for the development of yeast handling protocols in breweries, as well as tools for yeast selection using rejection quality limits and for improving yeast management. During the last two decades several methods have been proposed for vitality assessment and are being applied in breweries; however, no individual test has found widespread use. This work describes a method, named vitaltitration, of assessing yeast vitality, based on the measurement of yeast metabolic activity through the capacity of the yeast to acidify the environmental medium. The test is quite straightforward, only requires regular laboratory equipment and can be easily adapted to work in cellars. The method was used to follow the variation (decrease) of yeast vitality during storage under nutritional stress and was very sensitive to vitality decrease with storage time. Results correlated well with fermentation performance, opening the possibility of vitaltitration being used for process development and for yeast quality control.

Pedro M. Gonçalves Rodrigues graduated with a degree in biochemistry, with specialisation in food industries, Faculty of Science, Porto University, 1988. He enrolled as a Ph.D. student at the Faculty of Science, Porto University, 1999. His appointments include: 1996–1997, specialisation training in food industries at the Chemistry Investigation Centre of Porto University; 1997–2001, scientist associated with the project “A contribution to the improvement of the quality control on the process of brewing” and since 2001, scientist associated with the project “Determination of α -ketoacids and α -diketones as products of cellular metabolism, both under the supervision of the Faculty of Science, Porto University, and the brewery UNICER-Bebidas de Portugal, S.A.; since 1999, invited scientist at brewery UNICER-Bebidas de Portugal, S.A., conducting studies as part of the Ph.D. investigation; 2001, specialisation training (four months) in fermentation and microbiology at BRI in the UK; and, since 1998, junior consultant in food quality and safety assessments at ERGOMOL, Lda.

Poster No. 10**Sensory and Analytical Characterisation of Non-Volatile Taste Active Compounds in Bottom Fermented Beers**

Christina Schoenberger, *Lehrstuhl für Technologie der Brauerei I Weihenstephan, Freising Bavaria, Germany*

Co-Authors: Martin Krottenthaler, Werner Back

It was dubious until recently which of the non-volatile compounds in beer were contributors to the taste of beer. Other investigators in food taste active substances suggested that it was a combination of molecules in the low molecular range, e.g. amino acids, dipeptides, diketopiperazines, organic acids, di- and trisaccharides, purines, nucleotides, fatty acids, and ions. A systematic sensory and analytical screening of all non-volatile substances in beer and the determination of thresholds of those compounds in water and beer, as well as the clarification of additive and synergistic effects gives a clearer insight into the constitution of the beer taste and the contribution to the beer taste of individual non-volatile compounds. Knowing the contribution of all non-volatile compounds in regard to the taste of beer, those molecules can be associated either with the raw materials (barley, yeast, hops) or with their genesis in course of the brewing process. This knowledge provides the possibility to modify technological processes to shift the taste of beer in a controlled manner in a specified direction.

Christina Schoenberger studied brewing and beverage technology at the Technical University of Munich-Weihenstephan, Germany, receiving her graduate engineer diploma in 1999. Her diploma thesis work was titled “Solid phase extraction as a possible sample preparation for the determination of iso- α -acids in wort and beer.” Christina served as a brewing internship in Kyoto/Tokyo Japan at the Suntory Brewing Company in 2000. Since 2000, her doctoral thesis work was with the chair for Brewing Technology I, Prof. Back, in Weihenstephan. Her thesis was entitled “Sensory and analytical characterisation of non-volatile taste compounds in bottom fermented beers.”

Poster No. 11**A Vitality-Oriented Yeast Management Process in the Suntory Kyoto Brewery Using Recent Technologies**

Atsushi Fujita, *Suntory Ltd., Kyoto, Japan*

Co-Authors: Nobuyuki Fukui, Osamu Takemura, Takeshi Yonezawa, Hiroshi Ikeda, Yoshi Kakimi

Fine beer should be made only from good materials, vital yeast and a well-designed process. Based on this concept, we have reconstructed the whole process with the keyword of gentle handling, and our new brewhouse was presented at the World BrewingCongress in 2000. In this presentation we will show our new yeast handling system. For the desirable and well-controlled fermentation, total yeast vitality should be controlled at an equally high level in each fermentation. From this viewpoint we have rebuilt our process for the cropping, storage and pitching of yeast. First, we estimated the yeast vitality by their cytosolic pH during fermentation and decided the best point for cropping from fermenter. Second, to prevent loss of vitality during cropping and storage, newly designed cooler and storage tanks were introduced. Third, the on-line dielectric monitoring system for precise control of pitching was introduced. Through these improvements, the total yeast vitality could be controlled at an equally high level in each fermentation, and well-controlled fermentations to produce high quality beers were achieved.

Atsushi Fujita majored in nutritional chemistry at Kyoto University and engaged in the clarification of the effects of nutritional compounds on the formation of adipose tissue that stores fat. He joined Suntory Ltd. in 1992, working in the laboratory to conduct research on yeast metabolism and its modification by genetic engineering. After six years he moved to the Kyoto Brewery where the main subject of his work is optimization and development of the fermentation process. Atsushi is currently a senior assistant brew master in the Suntory Kyoto Brewery and is engaged in vitality-oriented yeast management especially for the production of Happoshu, which has poor nutritional compounds.

Poster No. 12**Membrane Filtration For Bright Beer: An Alternative To Kieselguhr**

Reinoud Noordman, *Heineken Technical Services, Netherlands*

Co-Authors: C.J. Peet, J.H. Mensink, L. Broens, and A. Mepschen

A collaborative R&D project between Heineken Technical Services and Norit Membrane Technology has developed a new cross flow membrane filtration process as an alternative to kieselguhr filtration. The key to this process is a new oxidative cleaning agent, which has been successful in maintaining run lengths of more than 10 hours. The costs of membrane filtration for bright beer are currently equal to those for kieselguhr filtration (about € 0.45 per hectolitre). It can be expected that process optimisations will continue to reduce the costs of membrane filtration.

Reinoud Noordman graduated as a chemical engineer in 1991 from the University of Groningen, The Netherlands. From 1992 to 1998 he worked at the University of Groningen on various membrane filtration projects (desalination, wastewater treatment and modelling) and product development (improvement of the shelf life of sweet products). In April 2000 he received a Ph.D. for his work in the field of membrane filtration. In January 1999 he joined Heineken Technical Services as a senior scientist and is now involved in the development of new separation processes (membrane filtration for bright beer and treatment of spent grains).

Poster No. 13**Practical Application of Multivariate Statistical Analysis for Evaluation of Sensory and Process Data from Full Scale Production**

Olav Vind Larsen, *Alfred Jorgensen Laboratory Ltd., Frederiksberg Copenhagen DK-1809*

Co-Authors: A.C. Lillelund, S. Aastrup, D. Byrne, and I. Williams

Experience shows that improvements in flavour stability are often a result of several minor adjustments, and it can be difficult to measure the influence of individual changes from full-scale production. A powerful tool to overcome this problem, is to use Multivariate Statistical Analysis to analyse data with the purpose of gaining a basis for taking qualified decisions regarding changes in process and/or raw material specifications. The presentation presents a data collection set-up allowing for a collection of data from sensory panels, laboratory data and data from full scale production, in such a way that these can be analysed using a Multivariate Analysis Software Package (the Unscrambler). Data was collected from routine beer production and trials, and the data have been analysed to establish relationships between sensory data, analytical data and process data, allowing for decisions for process changes to be made.

Olav Vind Larsen received his M.Sc. degree in chemical engineering/food technology from the Danish Technical University and his master brewer diploma from the Scandinavian School of Brewing in 1998. He is currently director at the Alfred Jorgensen Laboratory in Copenhagen Denmark, and heads a team of brewing consultants and yeast technicians helping brewers and maltsters around the world to improve their product quality and productivity.

Poster No. 14**pH Dependence of Radical Scavenging Activity of Polyphenols, Phenolic Acids and Sulfite**

Takashi Nakamura, *Kirin Brewery Co., Ltd., Yokohama Kanagawa, Japan*

Co-Authors: O. Franz and W. Back

The hydroxyl radical and superoxide scavenging activities of polyphenols, phenolic acids and sulfite at various pH levels including beer pH were measured to clarify their roles in the flavor stability of beer. Sulfite and almost all polyphenols and phenolic acids tested were observed to possess both hydroxyl radical and superoxide scavenging activities at pH 7.0. Although sulfite showed activities at a beer pH of 4.3, the phenolic compounds did not show any, or showed lower activities than sulfite at the same pH. Thus sulfite is proposed to play a more important role as an antioxidant in beer flavor stability than polyphenols and phenolic acids.

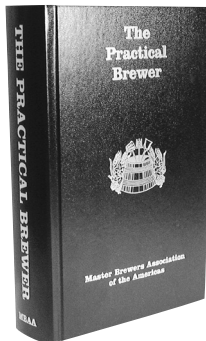
Takashi Nakamura engaged in enzymology and protein engineering studies, receiving his M.S. degree at the Tohoku University, Japan, in 1992. He was employed by Kirin Brewery Company, Ltd. as a scientist at the Research Laboratory for Brewing Technology Development Department from 1992 to 1999. From 1999 to 2001 he was a guest scientist at the Institute for Brewing Technology I (Prof. Back) at the Technical University of Munich at Weihenstephan, Germany. The subject of his study was "The role of polyphenols as antioxidants in the flavor stability of beer." Since 2001, Takashi has been a scientist at the Research Laboratory for Brewing at Kirin Brewery Company, Ltd.

SAVE BIG on books at the MBAA Convention

The Practical Brewer, Third Edition

Edited by John T. McCabe

Written by industry experts, *The Practical Brewer* is regarded as a trade standard achieving worldwide acceptance as an outstanding basic training tool in the art and science of brewing. From proven practical procedures to recent innovative technologies, the book offers practical solutions to many everyday concerns. The latest edition includes three new chapters dealing with low calorie beer/low alcohol beers, environmental issues and micro brewing. Since the first edition was published in 1946, *The Practical Brewer* has been an invaluable tool for providing information to new entrants in the field of brewing – and as a useful reference for the more experienced brewer.



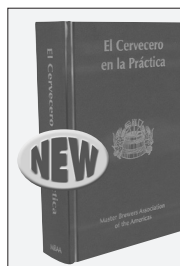
1999; 6 x 9 hardcover; 757 pages; 82 tables; 313 illustrations and figures

Convention SALE Price \$75
Regular Price \$100

SAVE \$25
When you buy at the MBAA Convention!

Chapter Headings:

World History of Brewing and its Development in the Americas • Water • Barley and Malting • Adjuncts • Wort Production • Wort Composition • Wort Boiling • Hops • Wort Cooling • Fermentation, Principles and Practices • Yeast – Strains and Handling Techniques • Overview of Cellar Operations • Packaging – Bottle Operations • Packaging – Draft Operations • Beer Quality and Taste Methodology • Statistical Management of Processes in the Brewery • Interpretation of Laboratory Results • Utilities Engineering • Brewery Cleaning and Sanitizing • Control Systems • Instrumentations • Low Calorie Beers • Low Alcohol Beers and Non-Alcoholic Brews • Environmental Issues Affecting Brewery Operations • Craft Brewing • Includes the following appendices: International Beer Flavor Terminology, Bengtsson's Tables, Kramer's Table, Metrication • Index



The popular *Practical Brewer, Third Edition* is now available in Spanish!

Written by industry experts, this valuable reference is regarded as an outstanding basic training tool in the art and science of brewing.

NEW and on SALE see page 6 in this program book for more details.

Beer Packaging

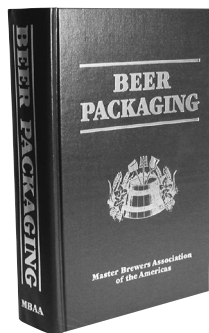
A Manual for the Brewing and Beverage Industries

Edited by Harold M. Broderick

Now in its fifth printing, *Beer Packaging* is a companion volume to *The Practical Brewer*.

This comprehensive reference covers principles of maintenance, troubleshooting, safety and sanitation as well as management functions, regulatory requirements and operation controls. This substantial manual is an essential tool for brewing practitioners at all levels.

SAVE \$30
When you buy at the MBAA Convention!



1982; 6 x 9 hardcover; 624 pages; 41 tables; 248 figures and illustrations

Convention SALE Price \$45
Regular Price \$75

Chapter Headings

The Management of Packaging: The Importance of Packaging, Packaging Management Organization, The Human Element, Management Reporting Systems, Packaging Department Layout • **Bottling Operations:** Bottles – Manufacture and Standards, Bottle Washing, Bottle Filling and Closing, Bottle Closures, Labels & Labeling • **Canning Operations:** Cans, Can Filling, Can Seaming • **Draft Operations:** Draft Operations • **Operations Common to Bottling, Canning & Drafting:** Beer Handling, Microbiological Stabilization, Product Packing, Product Identification, Warehousing & Shipping • **Soft Drink Operations:** Soft Drink Operations • **Related Packaging Functions:** Safety, Quality Assurance, Influence of Packaging Materials on Beer Quality, Packaging Line Instruments & Controls, Maintenance & Lubrication, Cleaning & Sanitation, Pest Control, Waste & Effluent • Index

www.mbaa.com



Toll-Free 1.800.328.7560

Poster No. 15**A Comparison of the Selective Removal of Beer Polyphenols by Lucilite TR and PVPP from All Malt Lager**

I.P. McKeown, *Ineos Silicas, Warrington, England*

Co-Authors: M.Thompson (1) and G.G. Stewart (1)

Certain types of polyphenols (so-called tannoids) are known to limit the shelf life of beer by forming haze with polypeptides, others are thought to increase flavour stability by acting as natural antioxidants, others contribute to mouthfeel. Reducing the tannoid content of beer is known to extend shelf life. A new product from Ineos Silicas called Lucilite TR selectively removes tannoids by mechanisms similar to the action of PVPP. The relative affinities of Lucilite TR and PVPP for polyphenols have been compared for different loading and contact times, using 12 degree and 20 degree Plato all malt lagers brewed in the ICBD pilot brewery. Beers were evaluated for sensitive protein and tannoid content, total polyphenols, chill haze formation and head retention, and subjected to forced aging.

Ian McKeown graduated with a bachelor's degree in applied chemistry and later with a doctorate in physical chemistry from Liverpool Polytechnic, England. His industrial research background is principally in the field of adsorption and colloid chemistry. In his present role as beverages technology manager for Ineos Silicas, based at the R&D Centre in Warrington, England, he is primarily responsible for managing the development and technical service activities for the company's global beverage business.

Poster No. 16**Development and Demonstration of Polymerase Chain Reaction Based Methods for Process Control in Brewing Industry**

Andreas Brandl, *Institute for Brewing Technology II - TUM Weihenstephan, Freising Bavaria Germany*

Co-Authors: E. Geiger and G. Vogeser

The presentation deals with the application of polymerase chain reaction (PCR) based methods for microbiological process control in breweries. Although beer is an unfavourable habitat for micro-organisms, contamination of the brewing process by even a few cells of certain bacteria or yeasts can lead to quality defects in the final product. Routine brewery quality control methods based on cultivation do not allow proactive process control because they reveal possible contaminations only after several days or weeks of delay. PCR is an in vitro nucleic acid amplification that allows rapid and specific detection of low levels of microbes. Using PCR it is possible to detect and to identify brewery contaminants at an early stage. For this purpose our institute together with other European institutes and five European breweries are currently taking part in a European Union project. The over-all objective is to establish rapid and safe PCR techniques in brewery laboratories. The principle of PCR detection and the results achieved with PCR detection methods in brewery laboratories will be presented at the MBAA congress.

Andreas Brandl served as an apprentice brewer from 1994 to 1996 at the Aldersbach brewery in Bavaria. He studied brewing and beverage technology at the Technical University Munich-Weihenstephan, receiving his graduate engineer diploma in 2001. His diploma thesis was entitled "Examinations on the stability of haze in wheat beer." Since then he has served as scientific assistant at the Institute of Brewing Technology II under the supervision of Prof. Geiger in Weihenstephan. He is engaged in the EU-Project "Development and demonstration of polymerase chain reaction based methods for process control in brewing industry" and in conjunction with this project he is also working on his Ph.D. dissertation.

Poster No. 17**Stability Index - A New Approach to Measure the Flavor Stability of Beer**

Oliver Franz, *Technical University of Munich, Munich Bavaria, Germany*

Co-Author: W. Back

Free radicals are responsible for oxidation reactions in beer. To determine the antioxidative potential of beer, the parameter stability index, which includes four different analysis resp. evaluations, has been created. The advantage of this parameter stability index is the ability to look at antiradical activities from four points of view, which is necessary because of the complex processes during aging. The parameters include the lag-time, which is influenced primarily by the amount of sulphur dioxide. Beside this evaluation, the area beyond the curve represents the antiradical activity of compounds such as polyphenols and other reducing substances. The third method is the antiradical potential against DPPH, which is influenced primarily by phenolic substances. The reducing potential of substances such as melanoidins is measured by their reactivity against dichlorophenol-indophenol. It can be shown that this parameter correlates very well with the staling flavor of beer. There is a remarkable correlation with the amount of tannoids in the wort. Mashing in with high temperatures and biological acidification of the mash showed the best results in increasing beer flavor stability.

Oliver Franz carried out six months of practical training at the Paulaner Brauerei GmbH & Co. KG, Munich, in 1992. He studied brewing and beverage technology at the Technical University of Munich-Weihenstephan, receiving his graduate engineer diploma in 1998. His diploma thesis was entitled "Investigation on the endogenous antioxidative activity (lag-time) during the brewing process of lager in practice." He has worked on his doctoral thesis with the chair for Brewing Technology I, Prof. Back at Weihenstephan, since 1999. His thesis is entitled "Systematic investigations on the endogenous antioxidative activity of beer in consideration of technological features." Since May 2000 he has served as head of the laboratory for GC/HPLC-Analytics with Prof. Back at Weihenstephan.

Poster No. 18**Use of Activated Carbon in Production of Malternatives**

Robert Potwora, NORIT Americas Inc., Pryor Oklahoma

Proper selection and use of activated carbon is essential for the base required for malternatives. Due to the activated carbon's ability to remove flavor and color, its use is essential in the production of malternatives. The type of activated carbon used has a great impact upon the flavor profile and color remaining. Different types of activated carbons were evaluated for their impact upon flavor and color removal. The relationship between the activated carbon's particle size and contact time was also investigated. This information will allow the user to select an activated carbon that will meet his objectives for a malternative.

Robert Potwora is a senior applications engineer for NORIT Americas Inc. He currently specializes in the use of activated carbon for beverage and food applications. Based at NORIT's Pryor, OK, facility, he has held various positions within the technical service group. He has more than 22 years experience in the activated carbon industry, devoted to solving technical issues related to production, quality control, and use of activated carbon. He is an active member of the American Society of Testing and Materials committee on activated carbon. He holds a B.S. degree in chemistry / biology.

Poster No. 19**Brewers' Yeast Oxidoreductase with Activity on Maillard Reaction Intermediates of Beer**

Ivan Galindo-Castro, *Empresas Polar, Caracas, Estado Miranda, Venezuela*

Co-Authors: B. Sanchez, L. Reverol, A. Bravo, J. L. Ramirez, and R. Rangel-Aldao

Maillard reaction intermediates 3-deoxy-2-hexosulose (3-DH) and 1-deoxy-2,3-hexodiulose (1-DH) are the most abundant dicarbonyl species in wort and beer, and may play an important role as precursors of carbonylic compounds associated with beer flavor deterioration. A cytosolic NADPH-dependent oxidoreductase from brewers' yeast that displayed catalytic activity towards 3-DH and other Maillard reaction dicarbonyl intermediates was purified to homogeneity. One of these carbonylic compounds was a highly sensitive chemical indicator of beer aging that turned out to be a key intermediate of the Maillard reaction. The N-terminal amino acid sequence of the 44 KDa polypeptide showed 96 % similarity to Old Yellow Enzyme (OYE; EC 1.6.99.1). PCR cloning of OYE from our brewing yeast and its recombinant expression in *E. coli* allowed us to obtain high protein yields after a simplified purification method. The addition of this recombinant enzyme to fresh beer reduced the area of chemical indicators and prevented HMF formation during storage at 28 °C. This enzyme may be a useful tool to reduce dicarbonyls during wort fermentation by preparing overexpressing recombinant brewing yeasts with the OYE homologous gene.

Ivan Galindo-Castro is corporate manager of molecular analysis and new technologies at the Innovation and Development Unit of Empresas Polar. Current activities of this corporate unit focus on the development of rapid microbiological tests, genetic improvement of yeast strains, plant (maize and rice) breeding assisted by molecular markers, and food biotechnology. Ivan is responsible for supplementing novel procedures to support the biosafety of the beverage and food production chain and for seeking new developments in the quality assurance area. Ivan studied molecular genetics at the Universidad Central de Venezuela (1988) after which he obtained a Ph.D. in molecular cell biology (1994, with honors) at the Universidad Simón Bolívar. Ivan received an award from the National Academy of Medicine (1994) and is co-inventor of several patents (USA and EU). During his career within Empresas Polar he has participated in more than nine international courses in the fields of biochemistry, yeast genetics, genetic engineering, fermentation technology, DNA probes design, bioinformatics, and PCR applications. He is co-author on 17 peer-reviewed publications in the fields of his expertise and has given various courses in the areas of PCR technology and DNA probes design.

Poster No. 20**Immunoassay Detection of Beer-Spoilage *Pediococcus* Spp. Utilizing a Novel Approach to Separate Bacterial Bound and Unbound Antibodies**

Kelly Tretter, *Coors Brewing Company, Golden CO*

Co-Authors: G. Quest, T. Dowgiert, and B. Ziola

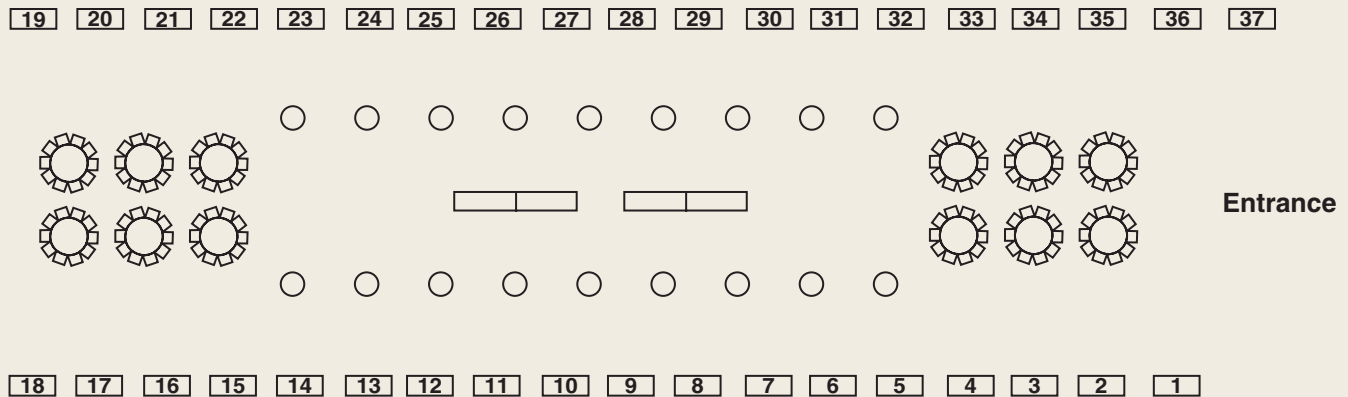
Assessing microbial content of beer faces two major challenges: concentrating few microbes from large volumes and handling the bio-concentrate to rapidly identify any microbe(s) present. We have developed a novel density gradient separation system for use within an immunoassay to detect microbes in beer concentrates. Our prototype work used *Pediococcus*, as these bacteria are relatively small and assay parameters for these cells will also apply to larger microorganisms. Bacteria were incubated with specific surface-reactive antibodies. Cells with bound antibodies were then separated from unbound antibodies by a 10 minute centrifugation at 4,000g through a 15% sucrose gradient. The resulting pellet was incubated with indicator antibodies and a second gradient separation was performed. The final bacterial pellet was resuspended in an enzyme substrate solution. The assay is completed in approximately 3 hours and has a sensitivity of approximately 3,000 bacteria. Through direct conjugation of specific primary antibodies with a DNA fragment, we expect that real-time PCR amplification after a single gradient separation step will allow a more rapid detection of even lower numbers of bacteria.

Kelly Tretter received her B.S. degree in biology at Colorado State University and plans on completing her M.A. requirements this December at the University of Colorado at Denver. She has worked for Coors Brewing Company for the past 10 years and last summer had the opportunity to work and study at the University of Saskatchewan performing research on a new enzyme assay and PCR methodologies to detect beer-spoiling microorganisms. Kelly is currently working in the Production Quality Control Laboratory at Coors as an analytical technician. She enjoys snowboarding, hiking, rock climbing and reading.

2002 MBAA Exhibition Longhorn Corral

Exhibition Hours:

Saturday, October 19 11:30 a.m. – 1:30 p.m.
Sunday, October 20 Noon – 2:00 p.m.



Exhibitors

- | | |
|---|--|
| 1 Profamo Inc. | 20 Diessel GmbH & Company |
| 2 Brock Solutions | 21 Butterworth, Inc |
| 3 Kalsec, Inc | 22 Westfalia Separator, Inc. |
| 4 FRINGS America Inc | 23 Waste Management |
| 5 EcoLab | 24 GKD-USA, Inc |
| 6 Brewers | 25 Briggs of Burton |
| 7 Orbisphere | 26 Solartron Mobrey |
| 8 Anton Steinecker Maschinenfabrik GmbH | 27 Loeffler Chemical Corporation |
| 9 Eurochem International Corporation | 28 Alfa Laval Inc |
| 10 Alltech, Inc | 29 INEOS Silicas |
| 11 Pall SeitzSchenk | 30 MEURA S.A |
| 12 Tyco Valves and Controls | 31 SMART Brewing Services |
| 13 ChemTreat | 32 ENERFAB, Inc |
| 14 Bray Controls | 33 Weyermann Specialty Malts |
| 15 NORIT Americas Inc | 34 Bruker BioSpin Corporation-EPR Division |
| 16 Haffmans/Norit Beverage | 35 Filtrox North America Co |
| 17 GusmerCellulo | 36 Buhler Inc |
| 18 Sudmo North America | 37 domnick hunter |
| 19 A. Ziemann GmbH | |

- A. Ziemann GmbH** 19
Schweiberdinger Strasse 86, Ludwigsburg, 71636
GERMANY, Phone: +49.7141.408.322,
Fax: +49.7141.408.296, Website: www.ziemann-group.com,
E-mail: joachim.gunkel@ziemann-group.com
- Alfa Laval Inc.** 28
955 Mearns Rd., Warminster, PA 18974; Tel: +1.215.443.4000,
Fax: +1.215.443.4112, Website: www.alfalaval.com. **Products or Services:** Alfa Laval offers a complete line of process equipment specifically designed for the brewing industry. Our key technologies are in separation, heat-transfer and fluid handling. Our core competences include process expertise, turn-key solutions and customer service.
- Alltech, Inc.** 10
3031 Catnip Hill Pike, Nicholasville, KY 40356; Tel: +1.859.608.0660, Fax: +1.847.205.5658, Website: www.alltech.com. **Products or Services:** Alltech, Inc. is the only company to offer full service to the alcohol industry. The Alltech Institute of Brewing and Distilling provides training and analytical services to the brewing and distilling industries. In addition its staff and faculty, consultants are available for plant audits, process review and troubleshooting efforts. Recently, the institute has introduced a complete line of biological media products, essential tools for the proper conduct of a good microbiological program. The Alltech Alcohol Division offers a comprehensive line of products as ingredients and processing aids for the fermentation industries, including yeast, enzymes, yeast foods, kettle coagulants, foam stabilizers and fining agents as well as defoamers. Alltech "customizes" courses and products to the "customers" needs.
- Anton Steinecker Maschinenfabrik GmbH** 8
Raiffeisenstr 30, Freising 85356, GERMANY: Tel: +49 (0) 8161 9530, Fax: +49 8161 953157, Website: www.steinecker.com. **Products or Services:** The lauter tun is the heart of the brewhouse. It beats the time of production. The new lauter tun method PEGASUS is able to speed up the beat. In the conventional lauter tun, lautering in the central area shows little flow, little teaching and a poor raking effect. In PEGASUS this surface is used more efficiently, namely for mash storage via a distribution loop. The mash storage from below is omitted and can be used as lautering area. Additional innovations include modified false bottom with larger open surface, new geometry of the knives for a high flow, and an improved raking effect, minimum enlargement of the diameter with unchanged lautering surface, array and design of gondola and inlets in a 60° angle. In combination with the array of swelling areas PEGASUS promises fast lautering of the wort, additionally optimized in quantity.
- Bray Controls** 14
8555 N. Eldridge Pkwy, Houston, TX 77041-1238; Tel: +1.281.517.5400, Fax: +1.281.517.5410 Website: www.bray.com. **Products or Services:** Bray Controls, with world headquarters located in Houston, TX, and manufacturing facilities throughout the world, will exhibit their comprehensive line of Bray and Ultraflo butterfly valves, Check Rite check valves, Flow-Tek ball valves, and Bray actuators and controls.
- Brewers** 6
312 Connell Highway, Newport, RI 02840-1037; Tel: +1.401.845.2072, Fax: +1.401.845.2073, Website: www.brewerswholesale.com. **Products or Services:** Brewers supplies and Quest products, Crisp and Glen Eagles malts, Ineos Silicas.
- Briggs of Burton** 25
5 Marway Circle, Rochester, NY 14624; Tel: +1.585.426.2460, Fax: +1.585.426.0250, Website: www.briggspc.co.uk. **Products or Services:** Dr. John Andrews, chairman of Briggs of Burton, will address Briggs approach to wort boiling. Commercial beers (500-1500 hls) have been brewed, employing nucleate boiling, with kettle heater surface areas up to 5 times higher than the typical internal heater. This work was designed to establish the optimum kettle heater surface to achieve the minimum evaporation compatible with required flavour and colloidal stability. Results demonstrate major reductions in evaporation and energy consumption with no reduction in wort quality. This allows much lower steam/wort temperature difference, and the number of brews between heater CIP can be increased to greater than 30. Retrofitting this high surface area heating technology to existing kettles is straightforward.
- Brock Solutions** 2
170 Evans Ave., Suite 304, Toronto, ON M8Z 1J7 CANADA; Tel: +1.416.505.5530, Fax: +1.416.259.0582, Website: www.brockolutions.com. **Products or Services:** Brock Solutions' brewing industry team has many years of experience in all facets of the brewing industry including specific expertise and project experience in the powerhouse, brewhouse, fermentation, filtration and packaging areas of a brewery, improving the performance of our customers' systems and processes. With our integrated approach to customer service, Brock Solutions is equipped to deliver a complete solution to your needs for full-scale automation and process improvement.
- Bruker BioSpin Corporation-EPR Division** 34
19 Fortune Dr., Billerica, MA 01821; Tel: +1.978.663.7406, Fax: +1.978.670.8851, Website: www.bruker-biospin.com **Products or Services:** EPR spectrometer applications for flavor stability of beer.
- Buhler Inc.** 36
1100 Xenium Lane, Plymouth, MN 55441; Tel: +1.763.847.0231, Fax: +1.763.847.9911, Website: www.buhlergroup.com. **Products or Services:** Buhler provides complete solutions for grain handling and processing in the brewing industry including raw material handling and storage, cleaning, conveying, grinding, weighing, process controls, and automation.
- Butterworth, Inc.** 21
16737 W. Hardy St., Houston, TX 77060; Tel: +1.281.821.7300, Fax: +1.281.851.5550, Website: www.butterworth.com. **Products or Services:** Butterworth offers CIP solutions with advantages on impingement cleaning, creating savings in time, water, waste, and chemicals. On display are the Type LT, Type N and LTBC units. Brewery applications include all brewhouse vessels, fermentation, aging and yeast tanks.

- ChemTreat** 13
4301 Dominion Blvd, Glen Allen, VA 23060; Tel: +1.804.935.2138, Fax: +1.804.965.0154. **Products or Service:** Water treatment chemical and automation technology as it relates to the brewing industry.
- Diessel GmbH & Company** 20
Steven 1 Hildesheim, 31135 GERMANY, Tel: +0049.5121.742.265, Fax: +0049.5121.742.153, Website: www.diessel.com, E-mail: jochen.gutzeit@diessel.com
- domnick hunter** 37
5900-B Northwoods Pkwy, Charlotte, NC 28269; Tel: 1.800.345.8462, Fax: +1.704.921.1960, Website: www.domnickhunter.com. **Products or Services:** domnick hunter has developed a CO₂ purification device specifically for the beverage industry. The range covers draught beer dispense, carbonated soft drink dispense and bottling/packaging operations. domnick hunter beverage protective systems are designed to remove typical trace impurities from CO₂ and provide a cost-effective solution to ensure a quality product. Some designs are disposable, offering a quick and convenient way to protecting your beverage. domnick hunter is a world leader in the field of compressed gas purification, liquid filtration and gas separation.
- EcoLab** 5
370 Wabasha St., St. Paul, MN 55102-1307; Tel: +1.651.293.4127, Website: www.ecolab.com. **Products or Services:** Ecolab provides sanitation products, systems, and services for the beverage and brewing industry, including CIP and automated control systems, specialty conveyor lubricants, cleaners, sanitizers and service expertise.
- ENERFAB, Inc.** 32
4955 Spring Grove Ave., Cincinnati, OH 45232-1925; Tel: 1.800.966.7322, +1.513.641.0500, Fax: +1.513.242.6833, Website: www.enerfab.com. **Products or Services:** Turnkey brewing process systems installations, shop and field fabricated process equipment, maintenance and renovation services, LASTIGLAS/MUNKADUR tank lining services, piping systems fabrication and installation, and Kieselmann valve/component product line.
- Eurochem International Corporation** 9
600 Wendell Court, Atlanta, GA 30336; Tel: +1.770.664.6005, Fax: +1.770.664.0418, Website: www.eurochem.com. **Products or Services:** Specialty chemical company supplying sanitation chemicals to the brewing industry; cleaners, sanitizers and conveyor lubricants for all your sanitation needs.
- Filtrox North America Co.** 35
2585 S. Sarah Ave., Fresno, CA 93706; Tel: +1.707.696.6133, Fax: +1.707.773.3926. **Products or Services:** Filtration equipment for the clarification and sterilization of beer; beer recovery from tank bottoms and return beer. Filtrox - Filtrojet[®] candle precoat filters, Filtrox - Microstar[®] C X-flow filters.
- FRINGS America Inc.** 4
1413 Sherman Rd., Ste 30, Romeoville, IL 60446-4092; Tel: +1.630.783.1407, Fax: +1.630.783.1410, Website: www.frings.com. **Products or Services:** Frings America, a Chicago-based subsidiary of Heinrich Frings, Bonn, Germany, provides laboratory, pilot- and production-scale equipment, instrumentation, process controls and turnkey plants for the brewing and biochemical industry. Featured will be: Alcosens probe for real-time process measurement and/or control of alcohol and temperature, Destens system for measurement and/or control of alcohol content in still bottoms, yeast propagators in standard sizes for R&D and production. The proprietary aerator design features high oxygen transfer, lower energy consumption and high cell densities, turnkey yeast and ethanol plants, upgrades and retrofits. The Alcosens probe and sterile yeast aerator will be on display.
- GKD-USA, Inc.** 24
5469 Moose Lodge Rd., Cambridge, MD 21613-3424; Tel: +1.410.221.0542, Fax: +1.410.221.0544, Website: www.gkdusa.com. **Products or Services:** GKD's Neverleak filter leaves build a consistent cake for filtration with no leaks or mesh puckers. GKD's techniques for continuous seam and tightly fitted mesh media are key to unparalleled performance. As one of the world's premier technical weaving mills, GKD-USA designs and produces filter medias on its own weaving machines.
- GusmerCellulo** 17
1165 Globe Ave., Mountainside, NJ 07092; Tel: +1.908.301.1811, Fax: +1.908.301.1811, Website: www.gusmercellulo.com. **Products or Services:** GusmerCellulo will display quality control instruments, filtration media, Novoenzymes, Process aids.
- Haffmans/Norit Beverage** 16
Marinus Demmeweg 30, 5902 RD Venlo, NETHERLANDS; Tel: +31 77 3232300, Fax: +31 77 3232323, Website: www.haffmans.nl. **Products or Services:** Haffmans B.V., in Venlo, Netherlands, represents The Norit Beverage Division. Products include CO₂ recovery, water deaeration, blending, carbonation, quality control instrumentation (see GusmerCellulo). Norit Process Technology, Hengeld, Netherlands, integration management provides for the beverage industry. Südmo GmbH, Riesburg, Germany, provides components and valves for the beverage industry, cold aseptic filling (see Südmo North America).
- INEOS Silicas** 29
111 Ingalls Ave., Joliet, IL 60435; Tel: +1.815.727.3651, Fax: +1.815.727.5312, Website: www.ineossilicas.com. **Products or Services:** Global supplier of silica-based beer stabilizers, including the Lucilite and Chill-Garde product range. Learn about the new Lucilite TR product and discuss ways to reduce costs and improve beer quality.

- Kalsec, Inc.** **3**
3713 W Main St., Kalamazoo, MI 49005; Tel: +1.269.349.9711, Website: www.kalsec.com. **Products or Services:** Kalsec is the leading producer of specialty hop extracts such as isomerized and reduced hop acids as well as distinct hop oils. These are the tools for precise bitterness control, light stability, foam enhancement, and flexibility in beer aroma and flavor.
- Loeffler Chemical Corporation** **27**
5700 Bucknell Dr., Atlanta, GA 30336; Tel: +1.404.629.0999, Website: www.loefflerchemical.com. **Products or Services:** The Loeffler Chemical Corporation is a premier provider of cleaning and sanitation products, specializing in breweries. Featured are new and innovative cleaning and sanitation concepts for medium to large breweries as well as customized sanitation programs for any size brewery, conveyor belt lubricants, bottle washing additives and beerstone removers. Also shown is a new line of beer line cleaning equipment for restaurants and professional beer line cleaning outfits. A new and innovative mechanical-chemical system assures clean beer lines and top draught beer quality.
- MEURA S.A.** **30**
Chausse d'Antoing 55, B-7500 Tournai, BELGIUM; Tel: +32 69 88 42 42, Fax: +32 66 88 42 49, Website: www.meura.com. **Products or Services:** Specialising since 1845 in the conception, designing, engineering and the manufacture of brewery equipment, Meura of Belgium has long been at the forefront of technological development in this area. With an active R&D centre, located in Louvain-la-Neuve, Meura continues its optimisation programme on brewing processes. Meura is well renowned for the Meura 2001 mash filter, of which more than 140 units are in operation in the world today. Meura offers a large range of high-quality solutions, namely a new milling process, involving grinding malt in water; Meura brewhouse concept, including new technologies that will enable you to reach high production rate with 100% of the laboratory extract yield; wort stripping – a new ecological and economical wort boiling system; yeast management systems.
- NORIT Americas Inc.** **15**
5775 Peachtree Dunwoody Rd., Suite C-250, Atlanta, GA 30342; Tel: +1.404.256.6150, Fax: +1.404.256.6199, Website: www.norit-americas.com. **Products or Services:** NORIT Americas Inc., a wholly owned subsidiary of NORIT N.V. of The Netherlands, is the world's largest activated carbon manufacturer offering 150 varieties of activated carbon. NORIT also offers activated carbon reactivation, carbon systems and services as well as membrane technologies.
- Orbisphere** **7**
3 W Main St., Buford, GA 30518-3035; Tel: +1.770.932.1400, Fax: +1.770.932.1230, Website: www.orbisphere.com. **Products or Services:** Orbisphere provides gas measurement solutions to brewers responsible for improving and maintaining product quality control. The company's exhibit will feature analyzers for total package oxygen, inline and portable systems for O₂, CO₂, & N₂, alcohol and O₃. Orbisphere has world headquarters in Switzerland and direct representation throughout North America.
- Pall SeitzSchenk** **11**
2200 Northern Blvd., East Hills, NY 11548; Tel: 1.800.717.7255, Fax: +1.516.484.3877. Website: www.pall.com. **Products or Services:** Pall SeitzSchenk will exhibit its complete filtration solutions for the brewing industry. Learn about the Durafil DE filtration, which replaces the use of screens in DE filters. It offers a sharper cut-off while reducing particle bleed with a factor of 10 relative to normal screens. The Profile Star TF series filters provides particle filtration above 10 micron and its fine filtration filters reduce contamination to 1.5 micron. Its applications for cold stabilization use its Ultipor filters and the benefits of its cluster filtration system. Information on its SUPRADisc filter with pore sizes from .2 to 20 microns for final or pre-filtration will also be available. The SUPRADisc replaces sheet media used for years in the brewing industry. It is a completely enclosed system that prevents atmospheric contamination and product loss.
- Profamo Inc.** **1**
4933 Featherbed Ln., Sarasota, FL 34242-1560; Tel: +1.941.346.3527, Fax: +1.941.346.2807, Website: www.profamo.com. **Products or Services:** Profamo Inc. presents some of its line of equipment from various European manufacturing partners, including Dr. Thiedig's Digox 5 dissolved oxygen meter and newly developed in-line CO₂ meter; Steinfurth's handheld CO₂ meter, temperature and pressure logger, and portable top torque tester; Lg automatic's foam tester; and Rotech's keg monitoring system.
- SMART Brewing Services** **31**
Oxford Brookes Enterprises, Oxford OX3 0BP UNITED KINGDOM; Tel: +44 1865 484413, Fax: +44 1865 484410, Website: www.smartbrewing.com. **Products or Services:** SMART Brewing Services provides microbiological analysis research and training for the brewing industry and associated industries. Services include contract research, microbiological and product analysis as well as method development and assessment. We provide training for production and technical personnel. Future courses will feature topics such as yeast quality and detection of brewing contaminants using molecular techniques. We promote brewing education by organising workshops and symposium. Future events include a fluorophore symposium in 2002, yeast and microbiology laboratory courses in 2003, and our 4th Oxford Brookes Yeast Congress in Oxford in September 2003.
- Solartron Mobrey** **26**
19408 Park Row, Suite 320, Houston, TX 77084-4860; Tel: +1.281.398.7890, Fax: +1.281.398.7891. **Products or Services:** Solartron Mobrey is a supplier of precision density, viscosity and level measurement to the brewing industry. The 7826 densitometer, 7827 viscometer, Squing II level switch, MSP 900 ultrasonic level transmitter and the MRL 700 radar transmitter will be featured.

Sudmo North America 18

6918 Forest Hills Rd., Rockford, IL 61111; Tel: +1.815.639.0322, Fax: +1.815.639.1135, Website www.sudmona.com. **Products or Services:** Sudmo will exhibit their full range of flow components, mix proof, mix proof butterfly, butterfly, angle seat valves, and pressure relief valves.

Tyco Valves and Controls 12

4607 New West Drive, Pasadena, TX 77507; Tel: +1.832.261.2400, Fax: +1.281.930.0166, Website: www.tycovalves.com; Tyco Valves and Controls is a world class manufacturer of valves, actuation and controls which have been utilized by the brewing industry for many years. Tyco provides valves for many applications within the breweries, including process as well as utilities. Some of the products Tyco manufactures include butterfly valves, ball valves, check valves, knife gates, safety relief valves, tank vents, sanitary valves, and actuation. Brand names include: Keystone, MCF, KTM, Prince, Rovalve, Hovap, Neotecha, Vanessa, Valvtron, Morin, Crosby, and Anderson Greenwood. Please stop by our booth to see the latest in valve and actuator technology.

Waste Management 23

807 Hamlin Center Rd., Hamlin, NY 14464; Tel: +1.585.303.0433, Fax: +1.585.964.9532. **Products or Services:** Waste Management strives to improve in the areas of safety, operational excellence, environmental stewardship, and ethical conduct. Its in-plant services will offer solutions specific to your industrial waste needs.

Westfalia Separator, Inc. 22

100 Fairway Court, Northvale, NJ; Tel: +1.201.767.3900, Fax: +1.201.767.4331, Website: www.wsus.com. **Products or Services:** Westfalia Separator, Inc. is a major supplier of the German tradition high quality centrifugal separation equipment and technology to the brewing industry since 1893. We manufacture and service clarifiers and decanters for brewery applications such as tank bottom beer recovery, green beer, hot/trub wort, and (prior to) kieselguhr clarification.

Westfalia Separator's high efficiency and economy assures a fast return on investment, reduced waste disposal volumes, no storage capacity requirement for filter residues and low operation, servicing and maintenance costs.

Weyermann Specialty Malts 33

Brennerstrasse 17, Bamberg 96052, GERMANY; Tel: +49 951 93220 33, Fax: +49 951 35604, Website: www.weyermann.de. **Products or Services:** Weyermann is a family operated malting company that produces the widest range of specialty malts made out of only Bavarian-grown two-row barley. We ship all over the world in 20 and 40-foot containers, bulk, or 25 kg or 50 kg bags, to brewpubs, microbreweries and macrobreweries.

Advertiser Index

Anton Steinecker Cover IV
Brewers Digest. 19
Briggs of Burton 5
Buhler Inc. Cover II
Enerfab. 8
Eurochem International Corporation 3
Filtrox North America Co. Cover III
ISP 7

Mugs & Suds: Milwaukee

A city steeped in the brewing tradition.



MBAA 2003 Convention
October 4-8
Hyatt Regency Hotel
Milwaukee, Wisconsin

Mark your calendar and plan to attend the 2003 MBAA Convention in Milwaukee, Wisconsin. Exhibition materials, and the 2003 Call for Papers will be available in December. Registration materials will mail in May.

www.mbaa.com

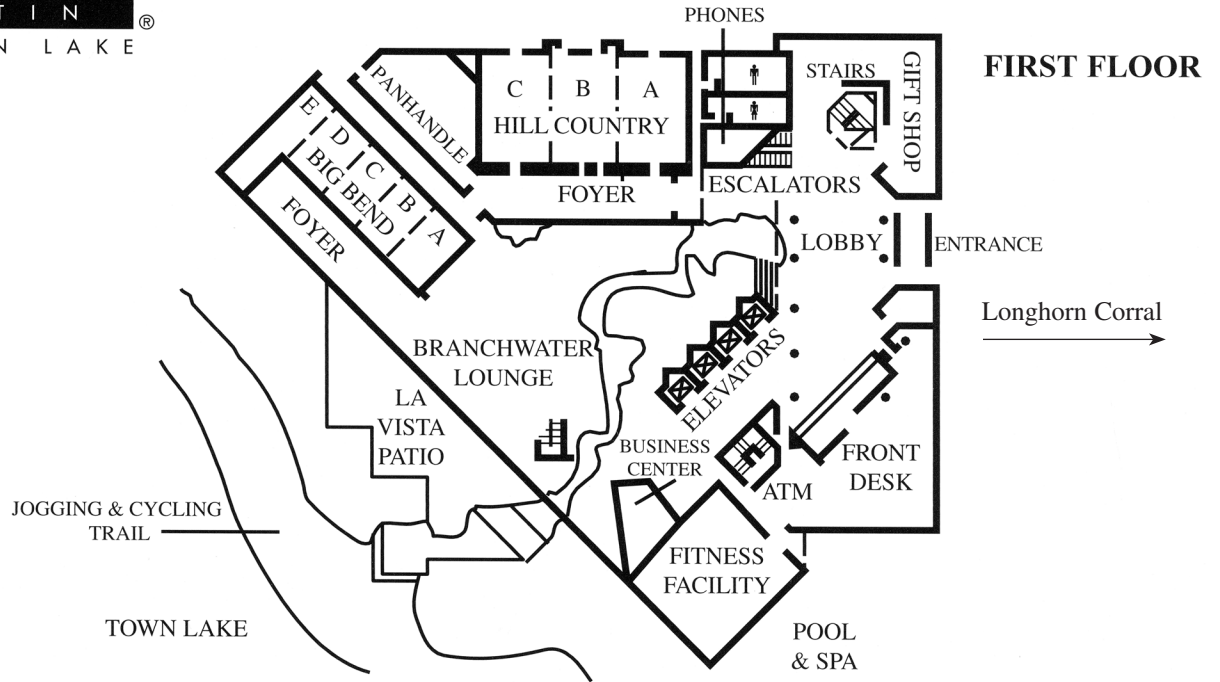


World Brewing Congress 2004
July 25 – 28, 2004
Hyatt Regency Hotel
San Diego, California

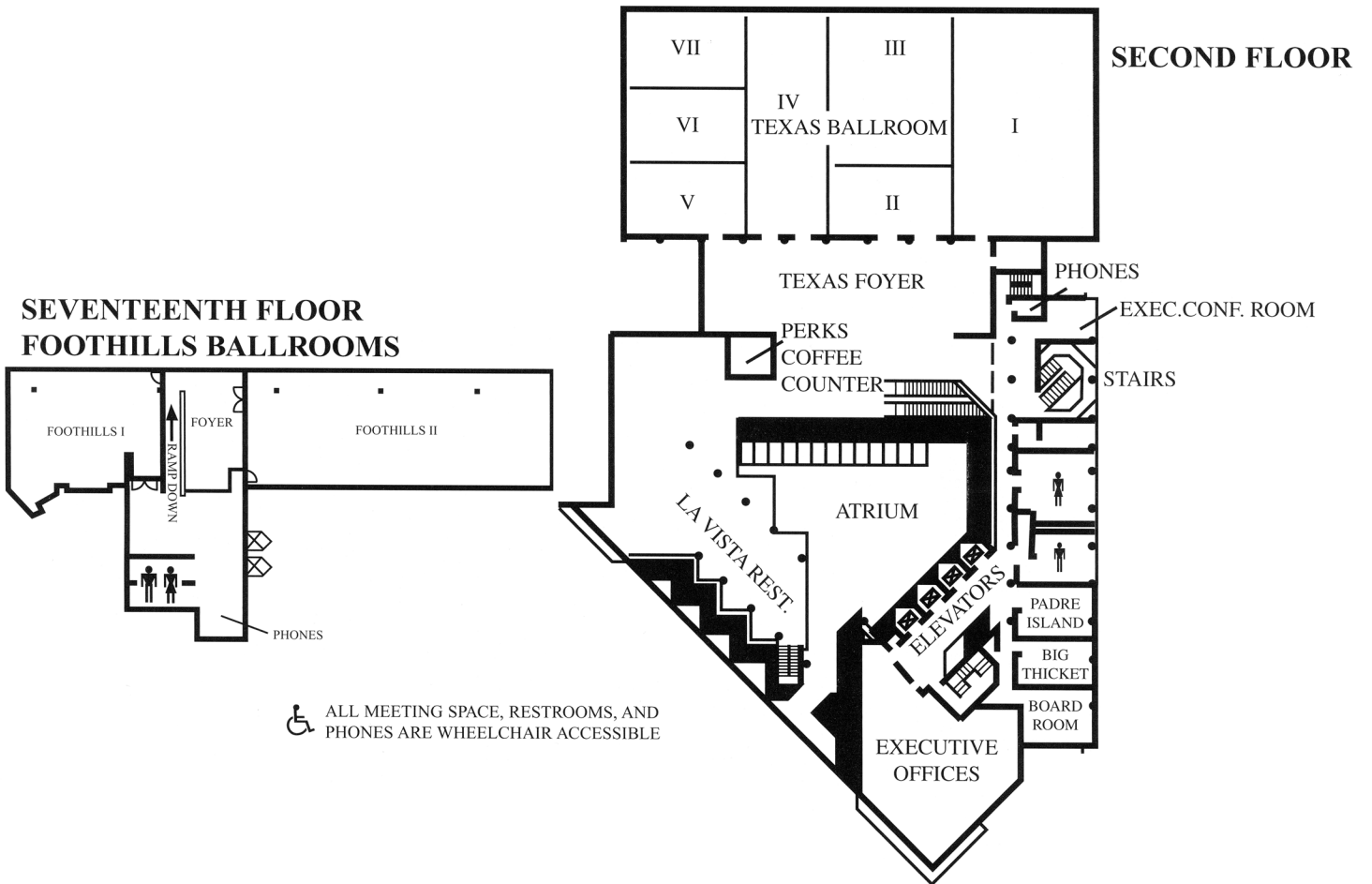


The world of brewing will come together July 25 – 28, 2004, when the World Brewing Congress convenes in San Diego, California. Current technological advances, new research results, the future of brewing and different methods of brewing, will be discussed on a global scale. Mark your calendar and plan to attend the World Brewing Congress 2004.

Watch the MBAA website for further details and registration information at www.mbaa.com.



FIRST FLOOR



SECOND FLOOR

**SEVENTEENTH FLOOR
 FOOTHILLS BALLROOMS**

 ALL MEETING SPACE, RESTROOMS, AND PHONES ARE WHEELCHAIR ACCESSIBLE



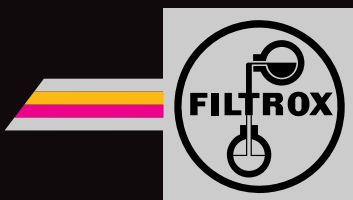
More!

If you want more in the way of performance and quality, you can't do better than **FILTROX!** In the past few years we have acquired tremendous know-how through implementing turn-key projects – and you can benefit from this.

Take advantage of our vast knowledge, our comprehensive range of services, and our friendly way of working.

We guarantee you'll get more for your money!

FILTROX – you can't ask for more!



FILTROX AG
CH-9001 St.Gallen/Switzerland

FILTROX NORTH AMERICA CO.
 2585 South Sarah Avenue, Fresno CA 93706
 phone 707.696.6133 – fax 707.773.3926
 E.Mail rrbrandau@earthlink.net <Brandau/Filtrox>

Pegasus

Pegasus - The Culmination of Lautering Technology

Anton Steinecker Maschinenfabrik GmbH, D-85356 Freising
sales@steinecker.com, <http://www.steinecker.com>

Steinecker Inc., Miami, USA,
Steineckerinc@aol.com, phone: (305)-639 9860

 **STEINECKER**
KRONES GRUPPE