Education In Brewing

By G.G. Stewart

ABSTRACT

There will be an increase in the requirement for trained brewing professionals due to a global expansion in brewing industry. This additional need will be predominantly in Africa, Central and South America, Eastern Europe and Asia. The expansion of microbreweries in North America and Britain will require trained brewers. As a result of “downsized” and “streamlined” business practices almost everywhere, future brewery managers will be required to be flexible and technical skills (although still very important) will only be a part of their abilities. In addition, people skills and an ability to function in empowered teams, business acumen and an international outlook will be important criteria. The successful brewing school of the future must be able to react to this changing environment by being flexible and programmed to develop “tailor-made” courses to accommodate a student’s specific requirements. Contemporary teaching methods such as computer interactive and distance learning must be employed alongside more traditional methods.

INTRODUCTION

The brewing industry has been wrongly described as “an art being transformed into a science” in fact it is “a craft that has evolved into a technology.” This evolution has centered on a number of factors of the business but always of importance has been brewing’s dependence upon education and training. This has focused on the qualifications and personality of its newly employed staff and on training and development of existing staff. Education and training in all industries has never been as important as it is today and brewing is no exception. Most brewing companies, large and small, recognize the value of highly trained, empowered and motivated employees. It is, therefore, important that facilities be available, both in-house and outside, to provide brewing education and training for prospective and existing employees. This is a tradition that began during the last century and has been a significant commitment ever since. This paper attempts to review the major centers available worldwide that provide this service and then describes, in some detail, the training programs in place at the author’s own brewing school in Edinburgh, Scotland.

TODAY’S BREWING PROFESSIONAL

Today’s brewing managers should possess a wide spectrum of skills. All other factors being equal, superior people handling skills and an ability to function in empowered teams are absolute necessities. Obviously a detailed, thorough understanding of the brewing process is expected which should include raw materials,
biochemistry, microbiology, downstream processing, process engineering and operations management together with quality control and quality assurance processes (including such areas as ISO 9000, HACCP and due diligence). In these days of close attention to “the bottom line,” basic knowledge of business principles including finance, industrial relations, strategic planning, human resources and marketing is required. Communications and public relations skills, together with an aptitude for problem-solving, are absolute necessities for any effective manager. The industry is becoming increasingly global, consequently, an international outlook will probably be essential for career development. Finally, a flexible disposition is critical. We live in an age of change where the only certain thing is uncertainty!

**TABLE I:**
Major Continental European Brewing Education Centres

<table>
<thead>
<tr>
<th>Institute</th>
</tr>
</thead>
<tbody>
<tr>
<td>UL de Bruxelles, Belgium</td>
</tr>
<tr>
<td>UC de Louvain, Belgium</td>
</tr>
<tr>
<td>Hogeschool Gent - CTL</td>
</tr>
<tr>
<td>Scandinavian Brewing School, Copenhagen, Denmark</td>
</tr>
<tr>
<td>Doemens Brewing School, Germany</td>
</tr>
<tr>
<td>VLB, Technical University, Berlin, Germany</td>
</tr>
<tr>
<td>Faculty of Brewing, Weihenstephan, Munich, Germany</td>
</tr>
<tr>
<td>ENSAIA, Nancy, France</td>
</tr>
<tr>
<td>VSB, Zurich, Switzerland</td>
</tr>
<tr>
<td>E’scuela, Superior de Cerveza y Malta, Madrid, Spain</td>
</tr>
<tr>
<td>Agricultural University, Vienna, Austria</td>
</tr>
<tr>
<td>European Brewery Convention</td>
</tr>
</tbody>
</table>

**BREWING EDUCATION AND TRAINING WORLD-WIDE**

**Continental Europe**

Formal education in brewing process and technology began in a number of continental European centers during the last century. Table I reveals that in Europe there are a number of well-established institutes with major centers in Germany, Scandinavia and Belgium. The German brewing industry has three institutes and a range of courses available. The university brewing schools are part of, or associated with, biological sciences or food science departments, and provide a broadly based undergraduate education, lasting 4 to 5 years, with a specialization in brewing. The alternative route of graduate entry via a post-graduate diploma or master’s qualification is also covered in these institutions. For example, the courses offered at Weihenstephan are:

- Diploma Engineering in either brewing and beverage technology or chemistry and food technology. Both courses are 4-1/2 years in duration, including a diploma thesis. Graduates can proceed to study for a Doctor Engineering degree.
- Diploma Brewmaster (2 years duration) or Beverage Technologies (an additional year) are very intensive courses and attracted 100 new entrants in 1994.
- Beverage Technologist is a supplementary year’s course available to those who have successfully completed the Diploma Brewmaster qualification. It extends the study of brewing, malting, beverage technology, engineering, economics, etc.

At Weihenstephan, there are currently 1250 students studying one or other of the above courses. Approximately 5% of the students are non-German speaking and they are required to take a course plus an examination in German.

There are five brewing schools in Belgium(2). So many because Belgium has three official languages. As well as education and training most of the brewing research in Belgium is conducted in e schools. It can be basic research, applied research and contract research. Further an advisory service is aimed at breweries and maltings and deals with microbiological or chemical analyses.

The Scandinavian Brewing School is run by the Scandinavian Brewers’ Association. The school has only a small teaching staff but draws on a large number of specialists based in universities and companies from the countries concerned and beyond. The most popular course - Diploma Brewmaster - is in English. It comprises 6 modules totalling 23 weeks and takes place every second year. The school also offers a Diploma for Brewing Technicians which is focused on people with a varying educational background who possess practical expertise in brewing. This course is also modular, lasts for 22 weeks and considers practical aspects of brewing. It is taught in the Scandinavian languages.

**TABLE II:**
“New World” Brewing Education Centres

<table>
<thead>
<tr>
<th>Institute</th>
</tr>
</thead>
<tbody>
<tr>
<td>The American School for Malting and Brewing Science and Technology,</td>
</tr>
<tr>
<td>University of California, Davis, United States of America</td>
</tr>
<tr>
<td>Siebel Institute of Technology, Chicago, United States of America</td>
</tr>
<tr>
<td>United States Brewers’ Academy, San Francisco, United States of America</td>
</tr>
<tr>
<td>Master Brewers Association of the Americas</td>
</tr>
<tr>
<td>American Society of Brewing Chemists</td>
</tr>
<tr>
<td>Alttech Alcohol School, Kentucky, United States of America</td>
</tr>
<tr>
<td>Ballarat University College, Ballarat, Victoria, Australia</td>
</tr>
<tr>
<td>South African Breweries, Training Institute, Johannesburg, South Africa</td>
</tr>
</tbody>
</table>

**“New World”**

Brewing education and training in the United States also began towards the end of the last century with the establishment of a number of private schools (Table II). A significant example is the Siebel Institute of Technology in Chicago. In 1882, Dr. John Ewald Siebel started a scientific school for practical brewers. The business expanded in the 1890’s when several of Dr. Siebel’s sons joined the Institute. Courses were conducted in both German and English and by 1907 there were five regular courses for brewers (basic and graduate), engineers, maltsters
and bottlers. The Institute has survived the problems of prohibition and today is as active as ever. Its objective, “to promote the progress of the industries based on fermentation, which is done by instruction, investigation, analysis and otherwise.”

There are currently a number of courses and some are conducted several times a year:

- Diploma course in Brewing Technology
- Short course in Brewing Technology
- Microbiology and Pub Brewing Operations
- Brewing Microbiology and Microscopy
- Sensory Evaluation of Beer
- Beer and Brewing: An Executive Overview

The Department of Food Science in the University of California, Davis, has for many years conducted a specialization in Brewing as part of its Bachelor’s degree. Also a two-year Master’s Degree in Food Science and a PhD degree all have brewing specializations. These degrees contain a brewing program that has been accredited (not exempted) by the Institute of Brewing for its Associate Membership Examination. This also applies to the Masterbrewers Program which is conducted by the American School of Malting and Brewing Science and Technology which is closely allied to the University. This School also conducts a number of other short courses, which include:

- Intensive Brewing Science for Practical Brewing
- Sanitation and Microbiology for the Practical Brewer

The School of Science at Ballarat University College in Victoria, Australia, currently offers four courses for the brewing and allied industries:

- Introduction to Malting and Brewing - a 6-day course which covers important aspects of malting and brewing sciences
- Graduate Diploma in Malting and Brewing - the course is conducted in modules which include brewing raw materials, brewing operations, yeast and fermentation, post-fermentation unit operations, quality management and engineering
- Graduate Certificate in Brewing Science
- Graduate Certificate in Brewing Packaging

All of the above degrees contain a brewing program that has been accredited by the Institute of Brewing for its Associate Membership Examination (AME).

The Incorporated Brewers’ Guild. The objectives of The Brewster Committee were:

- to make recommendations to The Brewers’ Society for the establishment of the standards and methods to meet the education and training needs of UK brewing industry
- to create a climate where brewers from overseas will wish to undertake at least a part of their education and training in the UK

The Committee concluded that the prevailing arrangements were neither satisfying the industry needs nor were they cost effective. It identified the following causes for their dissatisfaction:

- the lack of brewing industry input in terms of guidance and cooperation
- a decline in the standard of students enrolling in brewing science/technology degree courses
- the generally unsatisfactory practical training in both industry and the universities

As a result of The Brewster Committee’s conclusions, the following forward program was agreed:

- formation of a joint review committee on education and training by The Brewers’ Society (now the BLRA), The Institute of Brewing and The Incorporated Brewers’ Guild
- establishment of The International Center for Brewing and Distilling (ICBD) at Heriot-Watt University.

### TABLE III: United Kingdom Brewing Education Centres

<table>
<thead>
<tr>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICBD, Heriot-Watt University, Edinburgh</td>
</tr>
<tr>
<td>University of Birmingham, Birmingham</td>
</tr>
<tr>
<td>Brewing Research Foundation International</td>
</tr>
<tr>
<td>Institute of Brewing</td>
</tr>
<tr>
<td>Maltsters Association of Great Britain</td>
</tr>
<tr>
<td>Brewers’ Guild</td>
</tr>
<tr>
<td>Allied Brewery Traders Association</td>
</tr>
<tr>
<td>University of Sunderland, Sunderland</td>
</tr>
</tbody>
</table>

### The Current Situation in the United Kingdom

There are currently a number of education and training courses ongoing in the UK and these are listed in Table III. Although the University of Birmingham has discontinued its MSc course in Brewing and Malting, it still maintains a close interest in the industry and conducts a number of short courses including courses in support of The Institute of Brewing’s examinations. Although BRF International’s (BRFI) primary mission is: “to provide the pre-competitive research and development which enables its member companies worldwide to improve their technical performance, to achieve high quality standards and to complete more successfully,” it also plays an important role in education and training. Practical training programs are put together on an individual basis to suit the experience of the student, the requirements of the company involved and the available time. Programs may range from a 1 or 2 days’ intensive
An overview of the brewing process, to focused training in a particular technique, to several months engaged on a particular project chosen by the company.

More formalized training offered by the BRFI includes specialized on-line and flavor-training courses which are frequently held on member company sites. The Autumn Course is held annually. This week-long course is designed as a ‘refresher course’ for experienced brewery and malting staff. Other short courses, focusing on specific topics such as mashing and malting biochemistry, are arranged as the need arises.

The Institute of Brewing’s (IOB) program of education and training embraces its worldwide membership. It provides for the career-long requirements of members. The Institute publishes two journals which contain many papers and articles concerned with the latest scientific and technological developments within the industry. There are winter study programs, run by sections of the Institute, in the course of which papers are given and technical visits are made to brewers, distillers, maltings and other industrial establishments. The technical committees of the IOB run symposia and workshops on a variety of aspects of the process.

The Institute offers two series of examinations in modular form (3) which are widely accepted, both in the UK and overseas, as qualifications:

- Associate Membership Examination (AME) - this requires candidates to display a sound understanding of the science and technology applied to brewing and associated operations.
- Diploma Master Brewer (DMB) - this is the senior examination of the IOB and is a searching examination requiring candidates to display not only theoretical knowledge but experience in its application.

To assist members in preparing for both these examinations, the IOB conducts a series of ‘brewster’ courses. These are run in the UK and attended predominantly by UK-based members, but overseas members are increasingly traveling to the UK to participate. In addition, the IOB organizes a 5-week International Course in Brewing Science and Technology which is primarily attended by overseas delegates, with representation from the UK. Major conventions are run biennially in the Asia Pacific area and Central and Southern Africa, while in the UK similar events are run at Aviemore, Harrogate and at Oxford and Cambridge Universities.

The Brewers’ Guild is a major training organization. Seminars cover topics such as filtration, cask conditioned beer, kegging, dispensing, CIP, food safety, etc. Two-week courses for examinations are conducted annually:

- Practical Brewing aims to give production personnel a review of all aspects of the brewing process. It is a very practical ‘hands-on’ course and allows students to see and question issues that may not always be possible in their own brewery.
- Packaging courses cover all the main aspects of the process and are aimed primarily for the IOB’s DMB candidates.

The Fundamentals of Brewing Techniques (known as the Durham Course) is the largest course conducted by the Guild and is currently in its 23rd year. The course successfully teaches those who are not normally associated with the technical and practical aspects of brewing, the basics of the process.

The ICBD and Heriot-Watt University

The International Centre for Brewing and Distilling (ICBD) was established at Heriot-Watt University in Edinburgh in 1988 as a successor to the brewing school that had been in existence since 1971. Interest in brewing education and related areas at Heriot-Watt, however, stretch back much further than this to the turn of the century. The British School of Malting and Brewing at the University of Birmingham closed in the mid-1980s, and the ICBD is now the sole surviving institution in the United Kingdom that provides a package of courses, research, and consultancy for the malting and brewing industries. In addition, the location of the ICBD in Scotland makes it ideally situated to serve the Scotch whisky industry.

The ICBD is a partnership between Heriot-Watt University and the brewing, malting, and distilling industries. In addition to providing important funding, the industries nominate executives and senior technical managers to the board of management, the course committee and the research committee. They also provide visiting lecturers and opportunities for detailed site visits and discussions.

The ICBD is based on the self-contained Heriot-Watt campus at Riccarton (Figure 1). The campus is close to Edinburgh airport and is home to the James Watt Centre (Figure 2), which provides conference facilities (including a four-star quality, hotel-style residential block) and a research park in addition to the usual academic and student residential facilities. The ICBD is housed in the Biological Sciences building. Although it shares many facilities with other sections of the Department of Biological Sciences, the ICBD has its own suite of laboratories, a micro-malting plant, a 2.5-hL brewery (Figure 3), and two glass pot stills which include the correct proportions of copper to prevent flavor problems. This pilot plant was designed for maximum versatility and has the capacity for studies on all aspects of the malting, brewing, and distilling processes using a range of malted and unmalted cereals to produce mature beers and distilled spirits.

Figure 1-Aerial view of the 380-acre Heriot-Watt University Campus.
TABLE IV: 
Brewing and Distilling Degrees and Diplomas at ICBD

<table>
<thead>
<tr>
<th>Degree Type</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSc Honors*</td>
<td>Four-year course</td>
</tr>
<tr>
<td>Postgraduate Diploma*</td>
<td>Nine months</td>
</tr>
<tr>
<td>MSc*</td>
<td>One year</td>
</tr>
<tr>
<td>PhD (internal)</td>
<td>Three years plus</td>
</tr>
<tr>
<td>PhD (external)</td>
<td>Four years minimum</td>
</tr>
</tbody>
</table>

*This program covers the syllabus of the Institute of Brewing’s Association Membership Examination (AME) and, therefore, qualifies the student for exemption from that examination.

TABLE V: 
Course Outline: BSc (Honors) in Brewing and Distilling

INTRODUCTION

Year 1: Modules in biology, chemistry and mathematics or physics or outside option

Year 2: Modules in plant and microbial biology, biochemistry, chemistry, statistics, production management and basics of business

PART I

Year 3: Modules in malting/brewing/distilling science and chemical engineering and options from applied microbiology, biochemistry, and molecular biology

PART II

Year 4: Malting/brewing/distilling technology; research project

Education Programs at ICBD

The ICBD offers various education programs (Tables IV and V). The curriculum for the BSc with Honors in Brewing and Distilling is modular and was designed with input from industry members of the course committee, which includes representatives of the Institute of Brewing to advise on exemption from the AME. The ICBD programs cover the AME syllabus, thereby exempting students from this examination. The BSc includes modules on malting, brewing, and distilling science and technology, chemical engineering, applied microbiology, molecular biology, biochemistry, accounting and production management, plus a research project in the fourth year. Between years three and four, the program requires students to take a period of vacation training in a malting, brewing, or distilling company. The training period is at least eight weeks and must be supervised by a member of the company concerned. During this period the student must keep a log of events and write a detailed report of work performed. The final year consists of specialized modules, a research project, and a structured series of industrial tours and lectures. The modules may be taken by non-graduating students as “short courses” if desired. The postgraduate diploma and master’s courses contain the same core of lectures, laboratory work, industry lectures and tours, and experience in the pilot plant as is contained in the BSc curriculum. Augmenting the BSc program, however, the postgraduate diploma includes additional tutorials and a postgraduate lecture series given by senior members of the industry.
ICBD academic staff supervise the research of a number of PhD students. This research can be conducted internally in the ICBD’s laboratories at Heriot-Watt University or externally in an approved industrial or government laboratory. External PhDs have a minimum registration period of four years and the student is expected to submit regular and detailed reports to his/her University supervisor.

Continuing education throughout one’s career is an absolute necessity and the ICBD (along with many brewing schools) is endeavoring to fulfill this requirement. A number of short courses (2-1/2 days to one week) are currently conducted and others are being designed:
- Grain, Malt and Microbial Technology
- Analytical Methods in Malting, Brewing and Distilling
- Engineering Principles and Practices in the Distilling and Applied Industries
- Basics of Brewing and Distilling for senior executives who possess little technical background in brewing, distilling and malting
- Basics of Business for technical/production personnel in brewing, distilling and malting who require an overview of business practices (currently being developed)
- Company specific courses

CONCLUSIONS

Global trends are for an expansion in brewing and this will require an increase in trained brewing professions. The additional need will be in Africa, Central and South America, Eastern Europe and Asia. Brewery managers in the future will be flexible and technical skills will only be a part of their abilities. In addition, people skills, business acumen and an international outlook will be important criteria. The successful brewing school of the future must also be flexible and prepared to develop “tailor-made” courses to accommodate a student’s specific requirements. Contemporary teaching methods such as computer interactive and distance learning must be employed alongside more traditional methods. The ICBD at Heriot-Watt University has accepted this challenge and is developing brewing managers who will be relevant to the needs of the brewing and distilling industry in the 21st century.

BIBLIOGRAPHY


QUESTIONS AND ANSWERS

Q. “How do you explain the apparent diversity: companies are getting larger with more resources for in-house training vs. the increases demand for brewing schools?”
A. First of all, I am not sure that many companies possess increased resources for in-house training. As more and more of them downsize, one of the many casualties is an in-house training center. As a consequence of this, training and education are being increasingly out-sourced. In addition, the expansion of the micro-breweries has increased interest in training for brewers. Finally, although opportunities in brewing may be limited, students consider a degree in malting and brewing as a better value with enhanced opportunities compared to a degree in a biological science such as biochemistry, microbiology or molecular biology.

Q. “Are there many students from North America enrolled in Heriot-Watt brewing courses?”
A. Over the past five years on average there have been two students from both the United States and Canada per year.

Q. “How do you screen your students for their personal skills?”
A. Not an easy question to answer. Recently one of the major brewing companies in the United Kingdom interviewed a number of Heriot-Watt brewing students and they also participated on the company’s recruitment assessment center. The students were found to be technically very good and they all possessed superior individual skills but their aptitude to work in empowered and self-motivated teams was poor. As a consequence, team skills courses will be introduced into the curriculum including time spent on outward-bound type activities.