

Optical training in industry, Kodak's experience

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ABSTRACT

This paper is a brief review of optical training in the industrial setting at Eastman Kodak Company. Along with a short historical review, discussion of the past, present and near future Kodak optical training offerings, the differences in industrial training philosophy are presented. A description of present facilities, plus introduction to Kodak's new training facilities conclude the paper.

1. INTRODUCTION

This is a look at what Kodak is doing in Optical Training. TER, short for Technical Educational Resources (the new name for the consolidation of the major training departments within Kodak) has the goals to keep all employees well informed and prepared to do present and potential tasks that will keep Eastman Kodak Company at the forefront of technology. What are the differences in training in the industrial setting versus the academic? What types of training are presented? What type facilities and equipment are available? What are the future needs in training in industry?

2. HISTORY

George Eastman joined the industrial world of photography in 1880 with his dry photographic plate Company. In June of 1888, Kodak entered the optical industry with the first camera, "you push the button, we do the rest". The first camera lenses were made by other companies such as Bausch and Lomb. George Eastman brought several camera companies together in the late 1890's and combined them in a building that later, 1911, was named Hawk Eye Works, after a line of cameras made there by Blair Camera Co. Since then Kodak has been a world leader in optics. The optical design department was founded in 1913. Most of the optical design and manufacturing efforts were to support in-house needs, but others came to Kodak to benefit from the extensive resources and experience. Optical elements ranging from simple camera lenses to some of the largest and highest quality elements ever made have been produced by Kodak. Quantities of one-of-a-kind to millions a month have been produced in Kodak facilities. Systems complexity has ranged from the simple glass plates to complex electro-optical-mechanical-photographic systems that may include subsystems with hundreds of optical elements.

Rochester became the heart of optical industry and training with such late 19th and early 20th century industrial leaders as J. J. Bausch, Henry Lomb, Ernst Gundlach, George Eastman, and others who also helped the local academia financially and politically. Dr. Kingslake came to Rochester and the University of Rochester (U of R) in 1929, at the invitation of Chancellor Rees. He along with Dr. Taylor and later Dr. O'Brien developed the Institute of Optics, which, for many years, was the only college dedicated to optics in this country. In 1937 Dr. Kingslake also became head of the Kodak Optical Design Department. Monroe Community College (MCC) has developed an outstanding associates program emphasizing the practical side of optics. Rochester Institute of Technology (RIT) is world renowned in the photographic and graphic arts areas. These schools, Kodak, and other Rochester companies grew together.

Most industrial training in the early days was apprentice type. It would not be accepted today, but training was then called "Men's Training" for technical skills, or "Women's Training" for clerical skills. There were lectures for professionals. Many departments set up internal training sessions for their members. Kodak developed excellent relationships with the local institutions of higher learning and many individual areas benefited from cooperative programs for their people. Kodak has always been a leader in training, but training department optics information was limited to some photography courses that included a little about camera lenses. Employees with real interest in optics took evening courses at the local educational institutions.

In cooperation with MCC, Kodak developed one of the finest optical apprentice programs in the country. The biggest problem with that program was that it was too successful, most of the graduates moved on to higher positions. Additional people had to be trained to do the intended work.

In the mid-60's, Dr. John McCloud initiated an series to teach new engineers an introduction to optics. Another Kodak employee, Bill Ewald had been teaching an evening course in practical optics at U of R. Bill had taught the course for about 15 years, with many Kodak students. In the 60's at the urging of fellow Kodak workers, Bill started teaching a course in "crowbar optics" at Kodak.

In the late 60's a group was formed in the training department to record training courses on film. Ewald's course was to be included, but had to be formalized before recording. The course was renamed "Fundamentals of Optical Engineering". This became the first true optics course presented by the training department, available to all Kodak people. The film recording of the course was never completed, but the live course was one of the most popular technical courses at Kodak. At a later time the "Practical Optics" videotape course, presently offered through Image Makers of Pittsford, was recorded. Bill has retired, but the video course is still popular and presented frequently.

In the early 70's Dr. Ed Granger and John Carson, Kodak employees and professors at RIT, put together a graduate level geometrical optics course for Kodak Training, "Instrumental Optics". This course continues to be updated and presented regularly.

3. TRAINING FOR TODAY

Upon joining TER, my first objective was to become familiar with the existing courses and facilities. Departments working with optics, or having products that include optics, were surveyed to determine their needs. Each course was evaluated vs. the perceived needs of the varied areas of Kodak. If available courses did not meet the needs, the decision to update or revise was made. If additional subject areas required attention, additional courses were added.

Some courses were, and will continue to be updated as needed. Outside institutions, societies, and consultants were and are continually reviewed for available offerings. Often we found the expertise within the company or some recent retirees for special training needs. New offerings are developed internally if the needs can not be serviced otherwise. Kodak also investigated funding by government or outside sources to support training.

Many of the formal optical training offerings now available have been added in recent years. Optical training facilities did consist of sharing several well equipped, conventional training rooms, and excellent photographic facilities. The only dedicated optical items were a storage cabinet for paperwork and a few lenses. The instructors carried needed supplies and demonstration pieces to classes as needed. Outside instructors would also supply their own materials.

4. TRAINING CONSIDERATIONS

For any training, many aspects beyond the actual presentation must be considered. Who are we preparing to train, and at what level? Our training must be focused to give the company the greatest cost effectiveness. Operators can be more effective when they can relate to their task, and can discuss variables influencing it. Engineers and technicians can communicate more freely with their counterparts if they have introductory training in other disciplines. Managers and engineers frequently are knowledgeable in one area, but become involved in multi-discipline products, and must communicate with all. The half-life of technical training is continually growing shorter with the rapid introduction of new technologies. Therefore, the technical personnel must be continually updated on new developments in their field.

What is the actual cost: fees for the course and/or instructor, time from work, travel and lodging, travel time - paid or not, supplies and equipment, supplementary help to fill in for the student, administrative expenses, etc.? Who pays costs: individual,

department, division, corporate, outside funding, or are costs shared between two or more of the above? When are the courses presented: during, before, or after work hours? What are effects of: work schedule, trick work, vacations & holidays, sickness, or emergencies? Where will the training be offered: in-house, outside the plant, local facilities, out of town? Considerations must be made for the convenience of students and instructors, equipment availability, etc?

If all could attend conferences such as SPIE is sponsoring here, this week, maybe a lot of the training would not be required at the universities and internally within the large corporations. How many can your company afford to send? How many could come to needed sessions if we paid our own way? Would all go if given the opportunity? Would the training be at the correct level? Would there be time to attend all the sessions of interest? How could we pre-evaluate the offerings versus our needs?

There are additional concerns with training people from the industrial community. Students are not accustomed to the process of education. People can learn to learn through practice, but many of those in industry have not seen a classroom in years. These people (and I do not believe they are alone) cannot survive an hour of lecture. Many are familiar with 13 minutes of fast action, followed by interludes of even faster paced commercials, and frequent subject changes. To learn, hands-on activities are essential. This conflicts with the most efficient means of expelling information, the lecture. I have been told, and believe by self experience, that we retain at most, 7 to 12% of what is received in lecture. By using the old "tell'em what your going to tell'em, tell'em, and tell'em what you told them", might increase retention to about a third. Hands-on training can result in well above 50% retention. Some claim 75 to 100% retention.

I do not propose to be the soothsayer able to answer all these questions. Our aim is to offer Kodak people the best training opportunities at reasonable cost.

5. CURRENT OFFERINGS

TER, the Kodak training department today offers continually expanding selections in the optics field. In addition to the "Practical Optics" with Bill Ewald (facilitated live), "Instrumental Optics" with Dr. Ed Granger and John Carson are regularly scheduled. "Laser Safety", formerly handled by the Safety Department, is now administered by TER. My first major new offering was "Introduction to Optics", which compliments "Practical Optics", but goes much further and includes many hands-on sessions. Two spin-off courses developed from that are "Optical Element Cleaning and Handling" plus "Optical Print Reading". Experts from the Optical Design Department were employed to present sessions of "Introduction to Code V", with materials supplied by Optical Research Associates. A retired expert on the optical lens bench was contracted to teach some sessions on

testing with the lens bench. Experts from the optical manufacturing areas were organized to develop and present sessions of "Optical Products, Design for Manufacturing and Assembly". Consultants were hired to teach "Lasers, Principles and Applications", and "Lasers in Manufacturing". In conjunction with MCC, "Basic Optics" and "Optical Computations I & II" were developed. The need for instruction in holography is being met by a course developed and presented by an employee who is also with the faculty at RIT. A series of seminars, appropriately called the Optical Seminar Series, at which speakers from all parts of the company present work they have been doing is very popular. These seminars are designed to let Kodak people know what other Kodak people are doing in the field of optics, and to open lines of communication. Outside vendors and academic experts have presented special seminars on diode pumped lasers, residual gas analysers and updates on optical developments outside Kodak. Enrollment of Kodak people in the special summer optics courses at the U of R is also administered by my office.

6. PLANNED OFFERINGS

Recently it was determined that the "Laser Safety" course was great for users, but more was needed for the persons responsible for the lasers. In conjunction with the company Laser Safety Officer, we established and presented a course "Laser Designated Individual Training". Per requests from managers of areas that are or will be making products that include lasers, we are developing a course in laser product safety. The input, and instruction will be done by experts who have experienced the testing, documentation, and frustrations of obtaining required compliance on real product.

The need to teach "Laser Safety" to all employees who work around lasers has prompted two special sessions. The first will be a broadcast via Kodak's satellite TV network, KBTv, to reach Kodak locations outside Rochester. The second will be for the hearing impaired, with a person to sign the session.

There is also a great interest in interferometry from the viewpoint of theory, set-up and alignment, and evaluation or interpretation of the interferogram. Experts are presently developing courses to meet these desires.

Needs are continually reviewed and new or modified offerings will be developed if appropriate outside sources are not found.

7. FACILITIES AND EQUIPMENT

Two years ago it was determined that an optics training facility was needed and about 800 square feet was acquired for a lab and storage area. After review of sources of supply, some one meter lens benches, lens kits, and other optical training tools were purchased. Personal contacts were made and "available, usable for instruction" optical equipment was acquired from areas in the company. Having many friends in the optical fabrication and engineering areas helps

immeasurably. Now the instructors have the basic facilities at the classroom and needn't carry excessive loads to each class, and students have benches to work on. There is continual reviewing of needs and looking for items to improve the training capabilities. Where special equipment is needed that would not be practical to purchase, or too large for the lab, often arrangements to borrow or share use of existing equipment or facilities can be made.

In this past year TER has decided on combining all portions of the widely scattered training organization in a new facility. The new facility will have a total classroom area of nearly 77,000 square feet plus 19,000 square feet of offices. The Optics Lab is about 1,500 square feet, and will be well equipped. The new lab will incorporate all the features of the old, plus the little extras we found were needed through the last two years experience. There is sufficient storage, complete copying and printing facilities, and the photographic and electronic laboratories are nearby. The complete training facility has well laid out rooms, complete support staff, adequate equipment, all needed supplies, and plenty of parking. The facility as planned is an educators dream.

I am fortunate to be a part of TER during this major step into the future. I look forward to having some of you visiting or coming to lend your expertise in presenting information at our new facility. We are open to innovative ways to receive and share training experiences, such as improving telecast courses. And yes, we can provide training for more than just Kodak in our new facility. We can offer industrial type training to fill needs wherever we have the expertise and capacity.

8. CONCLUSIONS

The future is bright and expanding in the field of optics. Academia will always be the focus for theoretical optical training. There is also a great need for optical training within industry. At Eastman Kodak Company we will strive to provide the best possible training with a mix of offerings to supplement and enhance the theoretical and practical optical education of all our people. Our facilities and expertise are also available for those outside Kodak.

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