3-1983

A videotape of an optical lab, "Just what the doctor ordered: The optical lab in perspective"

Sheldon L. Hallstrom
Pacific University

A videotape of an optical lab, "Just what the doctor ordered: The optical lab in perspective"

Abstract

A sixteen minute videotape of an optical lab was made. This tape was prepared to be used in classes of ophthalmic optics to explain to optometry students how a pair of glasses is made. An account of each step involved in the process is contained on the videotape.

Degree Type

Thesis

Degree Name

Master of Science in Vision Science

Committee Chair

James E. Peterson

Subject Categories

Optometry

A VIDEOTAPE OF AN OPTICAL LAB

JUST WHAT THE DOCTOR ORDERED

THE OPTICAL LAB IN PERSPECTIVE

A VIDEOTAPE OF AN OPTICAL LAB
JUST WHAT THE DOCTOR ORDERED
THE OPTICAL LAB IN PERSPECTIVE

A Thesis

Presented to the

Faculty of the College of Optometry

Pacific University

by

Sheldon L. Hallstrom

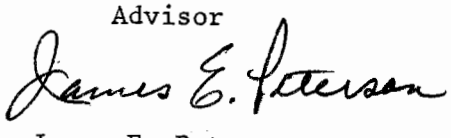
In Partial Fulfillment of the

Requirements for the Degree

Doctor of Optometry

March 1983

Advisor



James E. Peterson

Acknowledgements

I wish to thank all those at Opti-Craft who patiently cooperated with me throughout this project. Thanks also to Pacific University for the use of their video equipment. A special thanks to Dr. Douglas Stine, who was the initial advisor, and to Dr. James Peterson who supported and guided me through the majority of the project. I extend my appreciation to Dr. Willard Bleything for his assistance and for the original concept of making this videotape. Further thanks to Ed Collier for his expertise in narrating. A very special thanks to Gerard Gibbons for the countless hours involved in taping and editing.

Abstract

A sixteen minute videotape of an optical lab was made. This tape was prepared to be used in classes of ophthalmic optics to explain to optometry students how a pair of glasses is made. An account of each step involved in the process is contained on the videotape.

Time	Narration	Video
0:00	Have you ever wondered what happens in an optical lab? We know how to write a prescription, but do we know what is involved in making a pair of glasses?	car
0:11	I would like to welcome you to Opti-Craft, where more than 1700 pairs of glasses are made every day.	sign
0:17	In such a modern optical lab great care is taken to fill the prescription just as the doctor ordered for there are many critical steps along the way.	foyer
0:26	Let's enter the world of Opti-Craft and see what really takes place behind the scenes.	doorway
0:34	Most prescriptions are called in by phone and recorded on the lab forms. Great care is taken to obtain all the necessary information from the doctor such as frame color, seg height, and the patient's P.D.	starting room
0:48	The information for each job is placed in one of the many trays at the lab. These trays are color-coded to distinguish between jobs using glass lens blanks and those using plastic blanks.	trays
1:03	A unique conveyor belt system is utilized to transport the trays to each station throughout the lab.	conveyor belt
1:12	The information is then entered into the computer. The computer not only determines the doctor's bill, but takes the doctor's prescription, along with the characteristics of the frame and the patient's P.D. and computes all the necessary numbers to be used throughout the lab in manufacturing the glasses.	computer
1:33	The computer printout is placed in the tray and is referred to often by the individuals in the lab. The process is just beginning.	printout
1:43	In this room the computer sheet is used in locating the exact frame the doctor ordered. The eye size, bridge size and temple length are also found on the computer printout.	stock room

Time	Narration	Video
1:55	The frame fronts are usually stored separately from the temples. It is necessary for the lab to have a large inventory of frames so as not to delay the job by having to order the frame directly from the manufacturer.	frame fronts
2:10	Next, lens blanks are obtained for the job. These lens blanks already have a finished spherical front curve and bifocal. The appropriate toric back curve will be ground on the back of the blank here at the optical lab.	lens blanks
2:26	We now enter a large room where the real work begins. The conveyor belt will lead us to stations that will prepare the blank to be surfaced on the back. Other stations will finish this surface to a fine optical quality. A lens pattern will be chosen to act as a template to cut down the lens blank to the exact size and shape of the frame. The lens will be tinted and then inserted into the frame. As will be seen, each station is critical. Employees know that if thay fail to correctly perform their work the entire job must be done over.	large room
3:05	In order to generate a toric back curve in the correct orientation, a layout and blocking process must be carried out. First, a special protractor is used to mark the geometrical center and minus cylinder axis on the lens blank.	layout area
3:19	The lens is then sprayed with a coating so a metal block can adhere to the front surface of the blank along the minus cylinder axis. The metal block has to be positioned like this to allow the generating machine to hold the lens blank in the correct orientation.	spray
3:33	It's actually three pinholes in the blocking body that are lined up on the correct axis. Pressure is then applied to the back surface of the lens blank and the metal block adheres to the front.	blocking machine

Time	Narration	Video
3:54	This special machine does the layout and blocking all at once. The left side has the protractor where the layout is done. The rotating arm has the lens blank. The metal block is then applied to the right side, whereupon it is bonded to the blank.	special machine
4:15	This is the generator where the toric back curve is surfaced. The generator has three dials: one for regulating the base curve, one for regulating the cross curve, and one for the thickness.	generator
4:28	The blocking body, with the lens blank, is attached to the generator. The block is aligned correctly during this layout procedure so when it's attached to the generator the correct orientation corresponds with the three dial settings. The machine has a diamond-studded cutting wheel that cuts the toric back curve all at once.	close-up on blank
4:55	Even though the back curve is cut it is still very rough. A fining and polishing process must take place to get rid of the generator lines making this surface optically clear.	other generators
5:08	Fining uses orange aluminum oxide pads which are placed on a metal lap. The correct lap is specified on the computer printout. The back surface of the lens blank will move across the lap and a very fine grating process will smooth the rough lens surface. Fining is a process which takes approximately 2½ minutes to complete.	orange pads
5:33	It's done with these special machines.	fining machines
5:40	The laps are placed directly on the machine. The blanks are then placed on the upper arms of the unit, concave side down. They are brought to rest against the lap and the machine is turned on. When fining is completed the blanks are removed from the machine, blown dry and inspected.	fining

Time	Narration	Video
5:58	The blanks then move on to the polishing department. The 5½ minute process is very similar to fining. Magnifying lenses are used to check the polished optical surface.	magnifying lenses
6:15	It's time for the blocks to be removed from the blanks. The blanks, with the metal blocks attached, are put in a special tray and placed in a bath of hot water and soap. The blocks fall off the blanks and drop to the bottom of the tray. Any adhesive substance remaining on the lens blanks is cleaned off with the brush. The blanks are then thoroughly rinsed and placed back into the plastic trays.	deblocking
6:48	Great care must be taken to make sure the lens blanks get back into their respective trays so the orders will not become confused.	blanks back in trays
6:56	The trays are then taken over to the inspectors.	inspectors
7:05	The prescription is then checked at the next station along with the center thickness. The 180th degree axis is dotted with the lensometer. This axis will be referred to later during the layout process for pattern blocking. The inspector sets the axis first and then the power.	lensometer
7:25	The lens blanks are now optically clear and ready to be cut and edged to the correct size to fit their respective frames. Before the blanks can be cut and edged, the appropriate lens pattern must be selected. Once again the computer printout is utilized to obtain the pattern number.	pattern area
7:43	These numbers allow the patterns to be readily located among the many thousands on hand.	pattern numbers

Time	Narration	Video
7:50	Opti-Craft provides a unique service to its doctors. Many times the doctor calls and needs to know where his prescription is and how much longer it will take to process. Well, here at Opti-Craft, the computer is updated at this station to tell how much of the job is completed and how much longer it is expected to take until the prescription is filled.	blue box
8:13	The lens blanks can not just be cut to fit the frame. They must also be decentered to place the optical center directly in front of the patient's pupil. If this does not take place, resultant prismatic effects can occur. This decentration is accomplished by placing a metal pattern block in the correct location on the front of the lens blank before cutting and edging. The blank size is double-checked and the marked location is sprayed with an adhesive much like the procedure done in the first blocking operation.	pattern marking area
8:46	This is another machine that does the same, though somewhat more rapidly.	faster machine
8:56	The job moves on to the last stages of its travels through the lab. It has passed many stations so far and great care must still be taken so the lenses are not damaged during processing. What follows is pattern blocking, cutting and edging, and deblocking, followed by tinting, drop-ball testing and lens insertion.	conveyor belt
9:25	Here the pattern block is attached to the front surface of the blank. The plus mark on the blank is lined up with the center of the pattern block. Pressure is applied at this location and the block is firmly adhered to the blank.	blocking
9:40	The blank is now ready to be cut and edged. It is attached to the edger while the pattern is placed on the left side. The pattern looks like the eye rim shape of the frame but is usually smaller. An adjustment is made to compensate for the difference in size. This pattern acts as a template which the edger follows in	edger

Time	Narration	Video
	cutting the blank. By making the proper adjustments on the edger, blanks can be cut for different eye sizes using only one pattern. This particular edger cuts the bevel automatically.	
10:15	The operator monitors the progress of many of these machines at the same time. The shield is lifted so he can directly observe the blank being cut down to the right size.	operator
10:37	The pattern blocks are now removed from the lenses. The lenses, with the pattern block attached are put in a tray which is then placed in a special bath. Each tray is checked periodically to see if the blocks have fallen off.	deblocking
10:50	In order for the lens to fit properly in the frame, special hand edging and beveling is done. The lens is custom fit for the frame so it will not chip or fall out. A considerable amount of care is taken during hand edging and beveling.	hand edging
11:05	A continuous pressure and motion is applied to the lens at all times. The lens is kept at the proper angle to the wheel so the bevel will be uniform around the circumference of the lens. This procedure must be done with care but quickly enough so as not to hold up production.	large wheel
11:39	We are now in the area where tinting is done. Many doctors will order tints on their plastic lenses. Some of the tinting is done by hand, as in this case. The lens is dipped in the hot dye which is absorbed by the lens material. The amount of time the lens is left in will determine the darkness of the tint.	tinting area
12:06	Before the tinting is done the lenses are cleaned of all remaining residue.	cleaning

Time	Narration	Video
12:17	Sometimes the tinting is carried out by another method. In this method, an extended metal arm overhangs the dye. When the lens is attached, it will bob up and down in the dye to achieve the gradient effect seen on many of today's lenses.	extended arm
12:37	The tinted lenses are put back onto the trays and move on to where they will be drop-ball tested.	lenses in trays
12:43	According to federal safety standards, the lenses are tested using a 5/8th inch ball dropped from a height of 50 inches.	drop ball testing
12:51	Once again the lenses are inspected and cleaned. It's essential to check for any hairline fractures or chips. Any damage done by drop-ball testing would require the lens to be manufactured again. Once the lens has been tinted and tested, it is inserted into the frame.	cleaning
13:18	The frame used for this job is metal. Many metal frames require that extra care be taken with the lenses before they are inserted. Since metal frames are not as malleable as zyl frames, fine adjustments must be made to the bevel so that it will line up with the eyewire. Also, unlike a zyl frame, a metal frame does not stretch and could easily crack a slightly oversized lens.	metal frame
13:47	At this point, the job moves on to another area where fine adjustments and checks are made. Several measurements are taken and compared with the data on the computer sheet. This helps to insure that the job turns out to be just what the doctor ordered.	measurements
14:03	The glasses often require more minor adjustments. Sometimes, for instance, the lens is rotated slightly to line up the bifocal seg and any frame misalignments are corrected. Of course, many other types of adjustments are also made to insure that the glasses will be acceptable to both the doctor and his patient.	minor adjustments

Time	Narration	Video
14:28	The glasses are now placed back into the tray and move on to another station where they are cleaned and dried. Forced air is used to remove moisture on the lenses and is much faster and safer than using a towel.	cleaning
14:50	Now, it is time to verify the prescription. Special care is taken to insure that the power and axis are within tolerances. Also, the P.D. and seg heights are checked.	verification
15:02	Once again the glasses are cleaned before they are finally ready to be mailed to the doctor.	cleaning
15:10	Only the final packaging remains to be completed. The art of making a pair of glasses is a detailed process that usually takes only a few days. A modern and efficient lab, with quality control in mind, is essential. Each step is critical and great care is taken to ensure that the glasses are	packaging
15:36	just what the doctor ordered.	dispensing room
15:40	no narration	credits