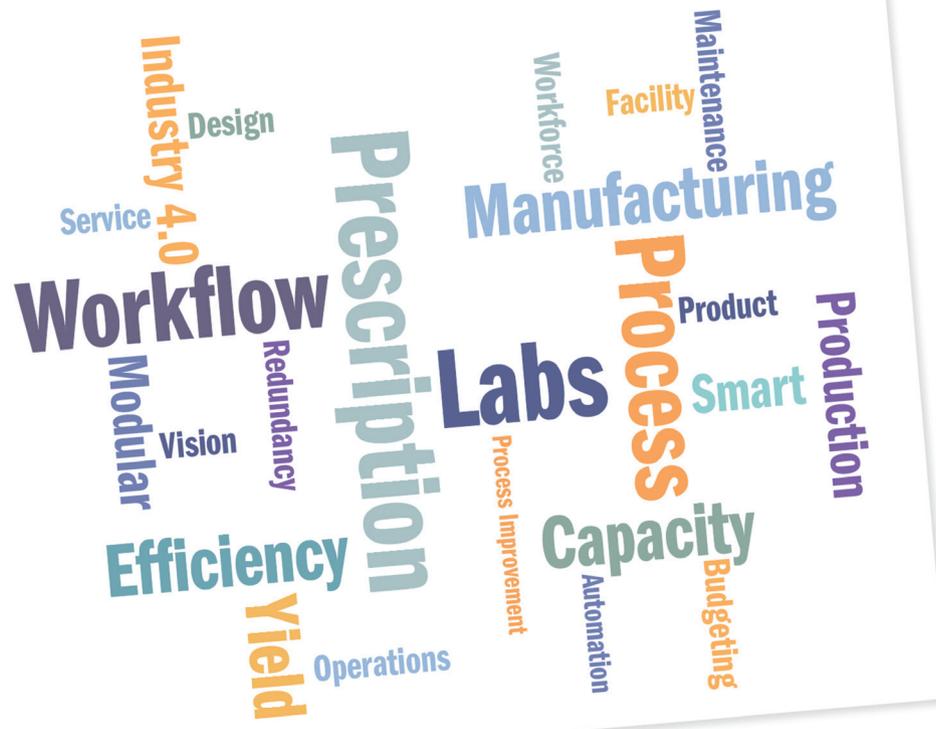


REENGINEERING & RENOVATION

How Optical Labs Stay on the Cutting Edge



BY ANDREW KARP / GROUP EDITOR, LENSES & TECHNOLOGY AND JEFF HOPKINS / CONTRIBUTING EDITOR

The term “work in progress” accurately defines most prescription optical laboratories. No matter how smoothly a lab may be running, there’s always something that needs updating or replacing, whether it’s adding a single piece of equipment, reengineering an entire production line or even building a whole facility. It’s an endless cycle of invention and reinvention, and labs must learn to adjust to it while continuing to service customers, a challenge which can be

daunting for any business.

Although the reasons for reengineering or renovating a lab are usually practical, they almost always have a strategic underpinning. The most common reasons are increasing efficiency, improving workflow, boosting throughput and capacity, and reducing manufacturing and labor costs, according to veteran lab owners and managers.

Ultimately, the goal of these projects, no matter what the size and scope may be, is to improve the quality of the ophthalmic lenses the lab produces while increasing the value of those products. Both are essential for a lab to remain competitive and operate profitably.

Staying on the cutting edge of technology, both literally and figuratively, has always been imperative for optical labs. But optical labs face a unique set of challenges. Unlike manufacturing businesses that produce products that are more or less uniform in function and appearance, optical labs must make personalized products, and they have to produce them in volume.

Creating and maintaining a rapid, repeatable manufacturing process that can still make one-of-a-kind products on demand is a conundrum that is somewhat unique to optical labs. It presents a set of problems that labs, together with the vendors that design and manufacture lens processing equipment and supplies, must regularly solve. The introduction of new lens materials and coatings makes this process even more complex, challenging the resourcefulness and creativity of labs and vendors.

In recent years, optical labs have made significant progress in these areas by adapting advanced systems and concepts used in other manufacturing industries. One popular approach, an end-to-end methodology known as Industry 4.0 that involves “smart” manufacturing processes and machines that can communicate to one another as well as to the operator, is achieving impressive results for many labs.

“The term ‘work in progress’ accurately defines most prescription optical laboratories. No matter how smoothly a lab may be running, there’s always something that needs updating or replacing, whether it’s adding a single piece of equipment, reengineering an entire production line or even building a whole facility.”

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Another recent technical advance is the development of modular systems in which all components are designed to function together optimally. These systems can be scaled to the needs of individual labs, enabling small- and mid-sized labs to enjoy the same advantages as larger ones.

To better understand the reengineering process and how it benefits labs, eyecare professionals and patients, *Vision Monday* spoke with owners and managers of labs that have recently upgraded their facilities. We asked them what the primary factors were that drove their decisions to upgrade; to what extent the availability of new technologies influenced their choices; how they collaborated with key vendors; and whether the results of the project met their expectations.

By sharing firsthand accounts, along with photos of work in progress, these lab executives help us to understand and appreciate the knowledge and ingenuity that was required to overcome the challenges they encountered and accomplish their objectives. Their reports provide a window into the inner workings of labs, through which we can see how their investments in technology result in better products and improved service, which ultimately benefit them and their customers.

Thanks to Kurt Atchison of Schneider, Andy Huthoefer of Satisloh and Alex Incera of Coburn Technologies for their guidance and input for this article. ■

Cherry Optical Lab: Moving From a Modern Lab to a Future Lab

Cherry Optical Lab Green Bay, Wisconsin

Synopsis: In May, 2020, Cherry Optical Lab began a major expansion and equipment upgrade project adding 6,500 square feet of production and creating a four-building campus. Company president Adam Cherry described how the complex process unfolded, and what resulted.

Lab Owner's Report: Adam Cherry

“**T**he driver for the reengineering project was the successes we have had, wanting to improve upon where we were, and also to get ready for the next level. These are some pretty big boys we're going up against, and if we aren't constantly innovating and trying to create the best proficiency in our process, we'll fall behind very quickly.

There's also the reality of being competitive in the labor market. We were overly reliant on low-skill manual labor—loading and unloading polishers and edgers, moving trays from one place to the other, scooping swarf. You can get great people, but who's going to want to do that for 10 to 20 years? Who wants to make a career of polishing lenses? For us, automation is about repurposing labor. We're trying to attract people with a skillset, people with a background in AutoCAD or electrical engineering.

There's a lot to be done to create the transition from a modern lab to

a future lab. A major part of the effort was expanding and automating surfacing. We really leaned in on our partnership with Schneider, and they came through very well. We gave them a canvas, and then they started to lay out what we could do in that space with what we have now, and what we can do in that space over time. They showed us how we would add equipment, how we can configure it, and what you can get out of it. They've got the experience and tools to estimate capacity and throughput.

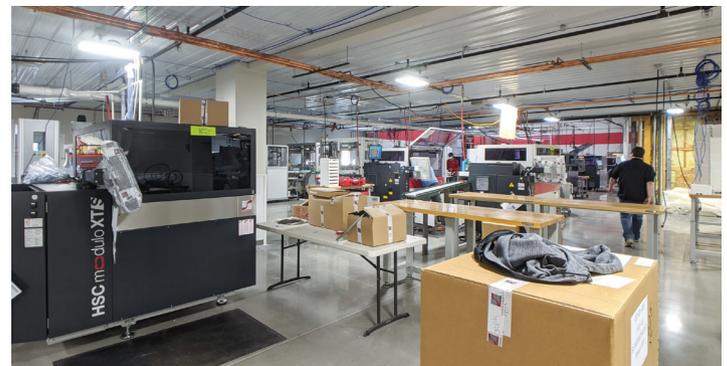
The glamorous part is the equipment, but how are you going to talk to all of these machines? How are you going to assure that the system is secure? Do you have the right power, do you have transformers all over, or do you upgrade your service to your building? Getting enterprise-quality and configured switches and redundant routers, and virtualizing servers added a whole other level of stress and anxiety. That's part of growing. All these machines run on air, and so you keep adding more and more and more. Now you've put a lot of pressure on your compressors. Is your compressor big enough? All this stuff needs to be thought of.

The parcel that our laboratory was on had three different buildings on it, and our vision when we bought the property was this expansion. Having the vision to see how the current layout is working was the reason we purchased the property with existing buildings. A green space build [an empty space] would have been nice,

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Installing the Filtertech LGEN Optical Filtration System. This swarf management system will allow the repurposing of the excess lens material.



The end of the digital surfacing line in the newly created production space.



The completed Schneider Modulo ring as seen from the preexisting department. Cherry Optical Lab subsequently sold the manual polishers, pictured back right, and replaced them with Schneider's upgraded and automated version, CCP Modulo One.

Transitioning From a Modern Lab to a Future Lab

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but it also would have been either dramatically disruptive or more expensive. Picking up and moving a fully-enabled laboratory that was doing a thousand-plus jobs per day was not something I wanted to take on.

We were able to keep everything going during the expansion. That was a task we gave to the contractor. Then, as they finalized the building, it was time for Schneider to come in and do their part on the surfacing automation, and similarly, we told them they had to keep running. We devised a plan where we could stage all the equipment near where it was going to go.

The team that Schneider brought in to build the automation ring was incredible. They worked 12- to 14-hour days, through the weekend. They were away from home in September and October, when COVID numbers were spiking—and they stayed dedicated and on the task.

We have already seen nearly 100 percent growth in utilized capacity since the expansion was completed in November 2020. Turnaround time isn't where we want it to be but, we are working like mad to improve that. The rapid return of business, combined with growth and a highly competitive labor market has added some stresses to the situation. We hear that we are doing better than our competition, but we really don't use our competition as a gauge of our performance. We're seeing progress with each passing week." ■



Adam Cherry

“We were overly reliant on low-skill manual labor—loading and unloading polishers and edgers, moving trays from one place to the other, scooping swarf. You can get great people, but who’s going to want to do that for 10 to 20 years? Who wants to make a career of polishing lenses?”

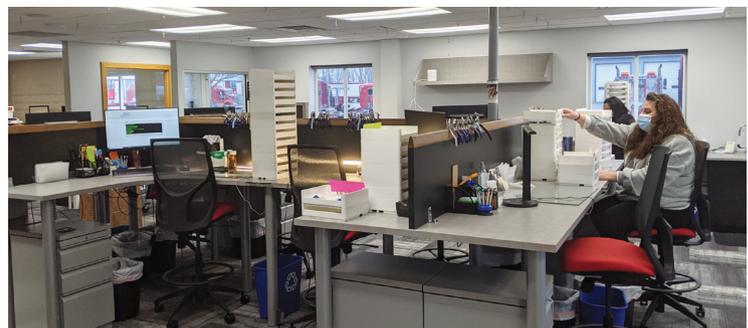
**Adam Cherry, president,
Cherry Optical Lab**



Adam Cherry reflecting on the accomplishments made throughout 2020. From concept through construction to moving in and upping capacity, the plans he paved are coming to fruition in the same way the pavement for new parking is being laid out.



The Cherry Optical Lab team and Schneider Optical Machines' technicians surveying the success of implementing the Modulo Ring and automation.



One of the final stages of the expansion was doubling the space for the finish department. This is the new section; Cherry Optical Lab mirrored the existing layout, knocked out the stairwell (not pictured) and replaced it with a more open feel to unify the spaces.

Automating With Robotics for Faster Speed and Better Quality at the Zeiss Lab

Zeiss Lab Hebron, Kentucky

Synopsis: Zeiss recently completed a multi-year, \$20 million reengineering project at their flagship lab in Hebron, Kentucky. Barry Lannon, head of lab operations and supply chain for Carl Zeiss Vision, managed the Industry 4.0 process. He explained what it took to plan and execute the multi-level project, and how Zeiss customers are benefitting from the upgrade.

Lab Manager's Report: Barry Lannon

“We needed to deliver premium product faster to our customers—obviously with the right quality. At the same time, our Global R&D team had developed a new manufacturing concept, and that basically was ready to roll out. It was decided that we in Kentucky were going to be the beneficiaries of this.

There is a lot of proprietary technology developed by Zeiss that we are using in the lab—whether equipment or conveyers. The conveyor system is actually very key—it is Zeiss intellectual property, and it's the central spine of the lab. It enables multi-way flow, whereas a traditional conveyor system is one directional—it's in or it's out.

We have a lot of internal production routing flexibility between prioritizing, processing, and sequencing the work. All of it is managed by a Zeiss production control system,

done in a way to give us a controlled increase in capacity as the business is growing.

The industry 4.0 concept that the lab is built on uses automation, robotics, big data and machine learning to assist in the production of premium quality products as fast as possible. One example is equipment. Historically, maintenance was done on a firefighting basis—when something went down, you went and fixed it.

The big trend more recently was toward preventive maintenance—you do a certain amount of routine maintenance on each equipment. We've taken that to that next extent—we've moved from firefighting, to preventive maintenance, to what we call predictive maintenance. We can theoretically predict when a machine will break down and take appropriate measures.

A lot of thought has gone into everything that's in the lab. The job trays are specifically designed, the material is anti-static so it doesn't attract dust. Sound baffles reduce the noise of the lab; some of the windows are frosted or dark glass for specific technical reasons; the coatings room is a true clean room environment, very tightly controlled. No matter what it is, if it's the color of something or a specific size or shape or feel, it has been thought through.

Basically, the reengineering happened all at once. We had an existing lab in Kentucky, and that lab continued to operate as it was at that time. But fortunately, in the same building we had available



Zeiss recently spent over \$20 million to upgrade and expand its facility in Hebron, Ky., which includes its state-of-the-art lab.



Barry Lannon (c) confers with his team.

space, so we were able to construct this lab and install this new technology—it was almost like it was a greenfield site. That was really the only way to do it—you can't take the lab out of production.

Once we had that first production line constructed, we shut down the other line. We completely dismantled it, which created a space to expand this new lab as we needed. The existing lab is in the physical space of the old lab, while in parallel staying in operation in the old lab.

There was a lot of collaboration between our R&D team in Germany and our principal equipment suppliers—Schneider, Optotech and Buhler—and our R&D team gave us a great deal of support. Several of them spent up to six months there doing

the installation of this manufacturing concept. It took many, many months, and once we were comfortable with it, we began to ramp up production. Once we had that first production line constructed, we shut down the other line. We completely dismantled it and took it out—that created a space to expand this new lab as we needed.

The concept worked. We built the first production line with all of the associated automation and robotics, and proved the concept. We made premium lenses faster, obviously at high quality, and that was noticed by our customers—so much so that demand began to increase, therefore, we had to do some further reinvestment and expansion. We wouldn't be expanding if the lab didn't do what it's supposed to do.” ■

“We've moved from firefighting, to preventive maintenance, to what we call predictive maintenance. We can theoretically predict when a machine will break down and take appropriate measures.”

Barry Lannon, head of lab operations and supply chain for Carl Zeiss Vision

Incremental Upgrades Yield Big Results for LBC Optics

LBC Optics New Berlin, Wisconsin

Synopsis: LBC Optics services Wisconsin Vision's 38 stores. The regional retailer was ranked 31st in Vision Monday's 2020 Top Retailer ranking. LBC's reengineering project was two-fold. The first was constructing a new conveyor line that could transfer job trays automatically using existing equipment that has the capability to function in this capacity. Second was installing a new control stacker and two new auto polishers to complete a line that produced 100 lenses/hour from blocker to final wash station.

Lab Owner's Report: **Andy George**

“The project took three weeks to install. Testing began at week four and we were running at full capacity by the end of that week. During these weeks we were able to outsource for 'uncut' work from a non-competing lab. This gave us a true clean slate to build the line from scratch.

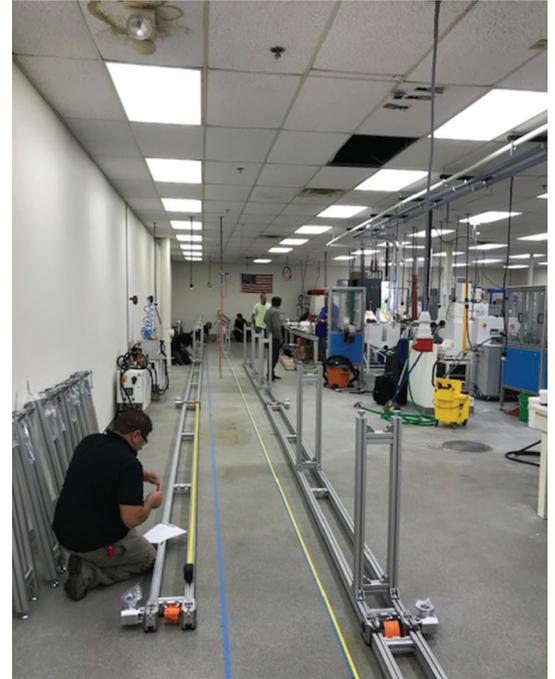
Since the installation in 2018, we replaced one older lens generator with a new one which seamlessly integrated into the line and increased production to 125 lenses/hour. The line itself has the capability to produce as much as 175 lenses/hour through future machine upgrades. Overhauling the surface line, including a switch from manual to automated polishers, significantly boosted the lab's productivity.

We had an immediate need to upgrade our lab, but we also saw the advantages

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Starting with a clean slate.



Beginning to build the conveyor system.



Making progress on the conveyer system.



The project is completed.

REENGINEERING & RENOVATION

Incremental Upgrades Yield Big Results for LBC Optics

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for a system that could grow through small upgrades without a complete redo. We installed a Schneider Modulo in 2018, and the line was set up for 100 lenses per hour. Fast forward three years. With one machine upgrade the line is now producing 130 lenses per hour with possibilities in the future of increasing to 160 lenses per hour.

Without the capabilities of the new surface lines to increase production over time we probably wouldn't have done it. So, the new technologies were certainly a huge decision-making factor, given the fact that over the years, even a decade or more, they can grow with you.

In order to keep the lab running during the installation, we outsourced our uncuts to a partner lab. Our surface line was completely down for three weeks, and it took another week until we were operating at 100 percent.

Our vendor, Schneider, played a huge role in planning and executing the project. They were 'on point' with a detailed plan. They have a great team, and planning is one of their strengths. However, the lab has a huge responsibility to ensure the best use of time. Electrical, plumbing, water, air lines and drain hookups were all done ahead of installation. Machinery was uncrated and unpacked. Those were big time savers for the installation teams.

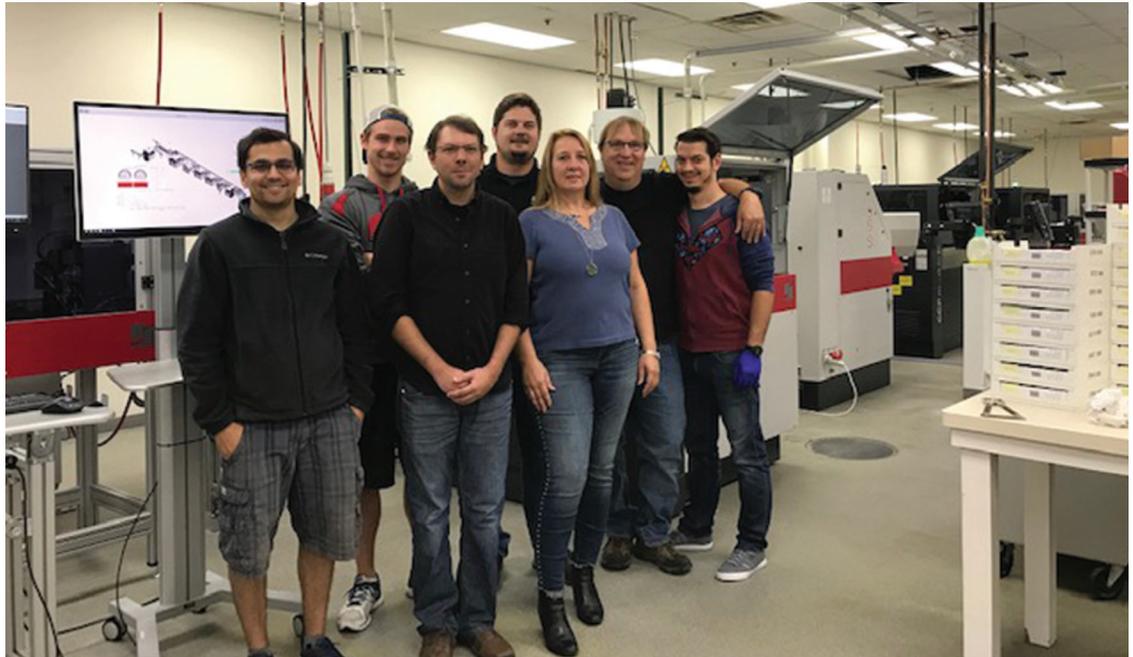
We've continued to make upgrades. Earlier this year, we replaced an older free-form generator for a latest and greatest model, and that alone resulted in a 30 percent increase in hourly production." ■



Installing the first piece, a stacker.



Next, the polishers are installed.



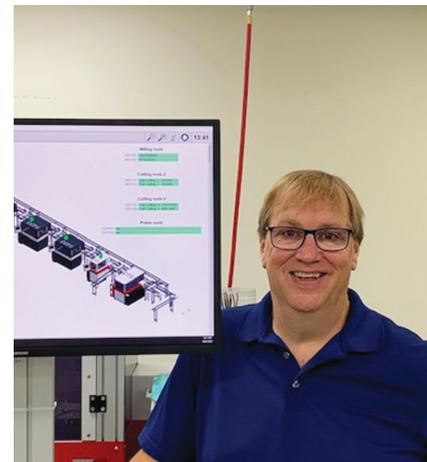
(L to R) The winning team included Marius George, Adam Gulrud, Chad McFadin, Aaron Braun, team leader Sandra Stry, Andy George and Dennis Petrick.



The last piece to be installed was a Schneider XT generator.

“We went from manual polishers to automated polishers. The difference was huge. We saw at least a 50 percent increase in the number of jobs we were producing.”

Andy George,
president, LBC Optics



Andy George

Plastic Plus Limited Expands to Accommodate Increasing Demand

Plastic Plus Limited Toronto, Canada

Synopsis: Plastic Plus underwent major expansions in 2008 and 2017, and is currently adding new equipment. (Most of this report refers to the 2017 expansion.) Lab owner and president Paul Faibish offered an inside perspective on how the lab was transformed by new technologies.



Paul Faibish



Plastic Plus is fully automated, from blocking to surfacing, to hard coating and mapping. No handling of lenses is required.



A smart conveyor system moves jobs trays from one point in the production line to the next.

Lab Owner's Report: Paul Faibish

“In 2008, we doubled the size of our building to 13,000 square feet. We added additional freeform and coating equipment at the time. We thought that would satisfy us, but we got busier and busier, and then in 2017 we pulled the trigger and bought the 30,000 square foot building next door. We moved the 50 or 60 feet from one building to the next. We filled it up, and as we speak we're expanding again. So we're not stopping.

We were actually the first lab in North America to process freeform lenses. We've been doing freeform now for 16 years. As demand has increased, we've seen the need for additional equipment, which is due to the need for redundancy. Space has always been an issue—we've gone from a couple of manual machines to one line of freeform, to two lines of freeform. Presently, we have three lines of freeform, fully automated, and we're talking about a fourth line as well.

Now we need more throughput, and we have to adjust a part of the conveyor system. We just ordered some new equipment, and we're having that installed. Over the next few months, we're

“Our customers have come to expect better quality, better service, and faster delivery time. The bar just keeps getting higher and higher all the time.”

**Paul Faibish, president,
Plastic Plus Limited,
Toronto, Canada**

going to acquire additional equipment and reconfigure our conveyor system.

Satisloh is working very closely with us, and they're going to upgrade the software so it's a smarter conveyor system. It will take six to nine months to get this completed. With COVID, things aren't working as quickly as we would like. Everything is more cumbersome. We've had delivery system difficulties, and even getting people over the border these days is difficult.

We're very lucky we were able to acquire the building next door, be-

cause that allowed us to run out of two buildings for about six months. We stayed in our old building while we renovated the new building. We added the new equipment to the new building section by section—for example, when we had the new generators up and running in the new building, we brought the old generator over.

And when we got the new polishers running in the new building, we brought the old polishers over. We actually had less than three hours' downtime over the entire process. There were multiple days when we worked around the clock, but we only had one IT outage for a couple of hours on a Saturday morning. It wasn't easy. We worked hard, but that's what you have to do.

The equipment manufacturers help us, but keep in mind that they're out to sell equipment. You've got to look out into the market, you've got to look at what your needs are, and we appreciate what they suggest, but sometimes the lab owners know what's best for

them and their market. We were very lucky that we had an excellent contractor. We've worked with the same trades for years, and the same trades came through for us and they worked very hard—electrical, IT, our shelving people.

Right now our entire lab is automated, from blocking to surfacing, to hard coating and to the mapper, everything is online and nobody touches a lens. We're busy—currently we're running our lab five days a week, 18 hours per day, and we're doing a shift on Saturdays as well. 100 percent of production goes on the freeform line, conventional and freeform lenses regardless of brand, and then we've got a large coating lab as well with full dip coating and AR.

Since the expansion in 2008, we're probably up 400 percent to 500 percent. Plus, between 2008 and now, our customers have come to expect better quality, better service, and faster delivery time. The bar just keeps getting higher and higher all the time.” ■

Wisconsin Vision Associates Serves Current and Future Customers Better

Wisconsin Vision Associates Burlington, Wisconsin

Synopsis: Wisconsin Vision Associates (WVA) is in the midst of a reengineering process that will more than double the lab's capacity. WVA's vice president for operations, Jeffrey Erickson, discussed the goals of the project and the many steps involved in bringing it to fruition.

Lab Owner's Report: Jeffrey Erickson

“In my opinion, a lab needs to continually improve processes. It is our goal never to be complacent, to always think about ways we can look at the manufacturing process differently and improve ourselves. We want to be here to serve our customers well today and serve new customers well in the future, and we want to make sure we have ample capacity to do so. Our current reengineering process is very exciting, and we want to make sure we have the capacity ready to answer to the demand that comes from that excitement.

The project is primarily an expansion effort, and with the expansion there is a component of reengineering. We looked at certain elements of automation and conveyance, as well as overall process improvement. We are more than doubling capacity, because we are bringing in newer equipment that will add greater efficiency to the process.

In addition, redundancy in manu-

facturing equipment is a key element of serving the customer. When a cog in the process goes down or creates an issue, we want to have another machine with a properly working cog in the process. We want to make sure we're available when our customers need us.

Since the inception of the project, Satisloh has been absolutely integral to us in our planning, engineering and equipment selection—all things lab design. They have been with us as a wonderful teammate throughout the process, along with Santinelli, which was responsible for a portion of the equipment.

Ocuco is our lab management software (LMS) provider and they have also been a great partner in helping us, as we've had to discuss new technology and how it would affect our LMS. Essilor has helped us discover what equipment and process improvements we might need to produce their great products, and they have also given us critical feedback about what the best of the best labs do.

A final component is our customers—they have provided us with good critical feedback that has helped us grow in the right ways, select the best technologies, and improve with the right processes.

Our new equipment has all been acquired, and is ready and waiting to be plugged in. Right now, we're working on the mechanical engineering to support the infrastructure for the lab. For instance, we are working on plumbing plans for water supply, humidity and temperature control for the



Jeffrey Erickson



WVA president and founder Robert Fait, OD, (c) with the lab team.

“We want to be here to serve our customers well today and serve new customers well in the future, and we want to make sure we have ample capacity to do so.”

Jeffrey Erickson, vice president for operations, Wisconsin Vision Associates



The WVA lab continues to serve customers while the reengineering process continues.



WVA relies on Satisloh Toro-Flex polishers in the surfacing department.

clean room, and things like that.

The plans and the equipment schedule are in the hands of the awesome mechanical engineers we work with for HVAC, plumbing, fire suppression and other needs. It takes a myriad of architects and engineers to bring a project like this to fruition as we work through the approval process and move to construction.

We are also very cognizant of the delicacy and the sensitivity of manufacturing changeover, so we're

intent on doing what we can during off-production hours. We have plenty of space to duplicate our current line, so we can just get it up and running while the current line is running—there will be no disruption at all.

Whether through lab manufacturing or any other services we're involved in, we are excited to continue investing in the industry in ways that help us to serve our customers well, and in the way they deserve.” ■

Satisloh's Checklist for Lab Reengineering

Satisloh, a leading supplier of lens processing systems and equipment, has developed this checklist of important items for labs to consider when undertaking a re-engineering project, and the key success factors for such a project.

- Assess current lab performance, strengths and weaknesses (cost, lead time, maintenance, staffs). This creates a baseline and also allows labs to identify improvement areas to focus on.
- Define short-, mid- and long-term business models: Lens only? Frame to come model? Integrated offer

frame + lens? online or retail? differentiation through express service? All of this influences how the product will flow through the lab and with that how the lab design should look.

- Define needed technology to fulfill the desired business model: volumes, product mix, lead time, performances.
- Renovating or greenfield decision? Expand and renovate or completely move out to another location: bigger, smaller, closer to airport/freight services? Closer to local retailers? Age and size of existing facility and cost to upgrade

infrastructure play a role. So does availability of new building space.

- In both cases, plan a 5- to 10-year business model and define the needed space to accompany the growth of the business over this time period. Don't move into a new facility that you will outgrow in three years.
- Build a layout that represents your long-term lab vision, even if, at first, you purchase and install only a small part of the equipment.
- Think automation from the get-go. It's much easier to invest in automation at the beginning than to retrofit.



- Think "people" from the get-go: space, health and safety, skills needed. The current staff will likely be part of the project and can be trained by experts such as Satisloh to master new technologies that the lab decides to invest in.
- Once the plan is developed, it all comes down to execution. It's important to select the right partner for the project and to limit the number of partners to work with. ■