Handling and Inspecting Contact Lenses

Challenge: Expanding Capacity While Improving Quality

Bausch & Lomb manufactures contact lenses in its state-of-the-art facility in Rochester, NY, as well as at a number of other sites in the US and overseas. They approached Rensselaer CATS to help optimize manufacturing, inspection and packaging processes for the Company’s new PureVision® line of contact lenses. B&L’s goals were to cost-effectively increase contact lens manufacturing capacity and improve quality control. B&L believed that they needed to automate the handling, inspection and packaging of contact lenses in order to eliminate the inherent variability associated with manual processes and reduce costs.

B&L sought external expertise in machine-vision-based inspection and industrial robotics that could expand their knowledge base and be dedicated to carrying the project forward. They also wanted a ‘fresh set of eyes’ to analyze their challenges and develop novel solutions. Before B&L could contract with an automation systems integrator to build production systems, they needed to be able to clearly define any new processes, mitigate the associated risks by developing proof-of-concept prototypes, conduct process-reliability testing, and fully document process and system specifications. B&L also wanted help identifying a “best in class” automation systems integrator to implement their new processes in product automation systems.

“The CATS offered Bausch & Lomb experienced professionals with industry knowledge, a breadth of technology-focused contacts...and access to RPI and its resources...an opportunity that paid large dividends.”

Thomas F. Natalie – Engineering Manager, Bausch & Lomb

Alternatives.

Bausch & Lomb considered continuing with existing manual processes involved in manufacturing, inspecting and packaging PureVision® contact lenses, growing their workforce to meet increased production demands. This approach was rejected, as it did not meet B&L’s cost-savings or quality-control goals. Another option was to bring in consultants and/or vendors to help solve their manufacturing and process challenges; however, B&L concluded that such partners tend to have a somewhat limited solution set from which they draw upon to solve their clients’ needs. B&L wanted an unbiased look at their challenges, starting with a clean sheet of paper. B&L could also have chosen to contract with an automation systems integrator to design and build new automated systems. But, systems integrators work best...
when they are first given detailed specifications with minimum levels of uncertainty – thus reducing costs, shortening schedules and minimizing technical risks. It was premature at this juncture for B&L to contract with an automation systems integrator.

A Systems Approach.
Bausch & Lomb chose to partner with the Rensselaer Center for Automation Technologies and Systems (CATS) to benefit from an unbiased look at their contact lens manufacturing challenges. The robotics and machine vision expertise within the CATS were a good fit for B&L’s challenges and stated goals. The CATS worked closely with B&L engineers to fully understand the issues and research cost-effective solutions.

CATS researchers do not start projects with pre-conceived solutions in mind – they approach problems without bias and with a disciplined, systems methodology. A balance of modeling, analysis and experimentation, combined with creative design, was used to define B&L's technical problems and identify feasible solutions. An assessment was then jointly conducted with CATS and B&L personnel to identify high-risk aspects of the proposed solutions. For each area deemed to be high-risk, a laboratory concept prototype – or Proof of Principle Model (POPM) – was built in order to establish the viability of the proposed solution. These risk mitigation processes employed by CATS researchers have proved to be invaluable in reducing uncertainty and in achieving cost and schedule control.

Once proposed solutions were proven in the laboratory, CATS researchers then worked with B&L engineers to prepare detailed process specifications that would be used to contract production automation systems. In parallel, the CATS assisted B&L in conducting a best-in-class search and evaluation to identify the ‘right’ automation company for their production system design and build.

Results:
Rensselaer CATS researchers succeeded in developing novel robotic material handling techniques for hydrated lenses, and solutions for machine-vision-based inspection of lenses prior to packaging. Process reliability tests demonstrated the soundness of the proposed solutions. Several US and international patents resulted from B&L's partnership with the CATS (6,729,835 B2; 7,164,470; 7,079,239; WO 2005/038426; WO 2005/038424; WO 2003/082552). Progressive Machine and Design of Victor, New York was contracted to build multiple PureVision® contact lens manufacturing lines for B&L. These systems, employing processes developed by CATS researchers, were deployed in B&L’s facilities worldwide.