

Implementation of Computer Vision Technology for Powerline Technicians

What's the Risk?

For Burlington Hydro, a services and utilities company in Burlington, Ontario, manual handling of heavy objects, awkward postures, and other overexertion activities are prominent issues for powerline technicians. Burlington Hydro reports that musculoskeletal disorders (MSDs) are their most common injury. To significantly reduce injuries in this trade, implementing innovative and effective solutions is essential to empower employees to perform their work safely and efficiently.

Before the pilot program, Burlington Hydro took significant steps to mitigate the risk of MSDs in their workplace by including ergonomic risks in their health and safety policy, implementing an ergonomics and MSD prevention program, conducting risk assessments, and performing ergonomic evaluations along with collecting individual or group discomfort surveys. Burlington Hydro also utilized an office-based MSD hazard identification tool. Their more traditional approach to ergonomics and MSD prevention was deemed by Burlington Hydro as reactive, tedious, time-consuming, and expensive without ergonomic expertise in-house. Without proper assessments, it was difficult to know where to invest resources to address concerns and eliminate risks.

Project Aims

Through their participation in the [MSD Solutions Lab Pilot Grant Program](#), Burlington Hydro aimed to address their reactive approach to ergonomics by using a vision-based application for ergonomic assessments to shift toward a proactive approach. Using the computer vision software from TuMeke allowed Burlington Hydro to video job tasks, identify risks for each task, and determine solutions to prevent MSDs. This was intended to have a positive effect on injury rates and their workplace culture. Further, it aimed to lessen the load of employees to manually complete ergonomic assessments.

Implementation of Computer Vision Technology

Burlington Hydro piloted the TuMeke technology for six months, from September 2023 to March 2024. Burlington Hydro outlined three main project steps. Those steps and the components are:

1. Create a department task list – This involved working with various departments to gather a list of tasks using safe work procedures, risk assessments, hazard registries, past ergonomic assessments, incidents, and discomfort survey data. A total of four department task lists were generated that highlighted 137 tasks across powerline, metering, maintenance, and stores departments. Tasks with the highest MSD risk were identified.

Figure 1. Task List Example from Burlington Hydro

Task Name	Safe Work Procedure #
Attaching slings	LNE 5.04 Overhead Live Line Work – Rigging and Hoisting
Carrying heavy material	GEN 1.05 Manual Lifting
Change the insulator	LNE 5.16 Overhead Live Line Work – Insulator Change Tangent Structure
Climbing and descending portable ladders	GEN Portable Ladders and Inspection
Hand digging with shovel	LNE 5.12 Overhead Live Line Work – Temporary Support of Wood Poles
Handling load lines	LNE 5.04 Overhead Live Line Work – Rigging and Hoisting
Handling pole with rope or guys	LNE 5.14 Overhead Live Line Work – Handling Structurally Damaged Poles
Handling tools while in the bucket	LNE 5.03 Overhead Live Line Work – Material Handling
Install jumper	LNE 5.10 Overhead Live Line Work – Work on Dead-Ends
Install jumpers	Various
Install lighting arresters using the mounting provision	LNE 5.05 Overhead Live Line Work – Installing SCADA-Mate Switches
Install line equipment	LNE 5.10 Overhead Live Line Work – Work on Dead-Ends
Install temporary rope guys	LNE 5.12 Overhead Live Line Work – Temporary Support of Wood Poles
Installing and removing grounds	Various
Installing fibreglass guard	LNE 5.07 Overhead Live Line Work – ABS Maintenance or Repair
Installing in-line switches	LNE 5.15 Overhead Live Line Work – Installing of In-Line Switches
Installing quick sleeves	Various
Installing rubber coverup	Various
Installing the leads	LNE 5.17 Overhead Live Line Work – Single Phase Distribution Tx
Installing vehicle blocking	Gen 1.13 Wheel Chocks
Loading poles onto the pole trailer	Various
Make all repairs and adjustments	LNE 5.07 Overhead Live Line Work – ABS Maintenance or Repair
Manual lifting	GEN 1.05 Manual Lifting
Mounting and installing the transformer	LNE 5.17 Overhead Live Line Work – Single Phase Distribution Tx
Mounting/installing the transformer	LNW 5.06 Overhead Live Line Work – Paralleling Single-Phase Tx
Open and installing all six Pig Tail connectors	LNE 5.07 Overhead Live Line Work – ABS Maintenance or Repair
Operating hand tools	GEN 1.12 Hand tools
Removing submersible vault lids	Various
Replacing damaged conductors	LNE 5.09 Overhead Live Line Work – Insulator Change on Angle Structure
Rigging material or equipment	LNE 5.04 Overhead Live Line Work – Rigging and Hoisting
Securing load on truck/trailer	LNE 5.03 Overhead Live Line Work – Material Handling
Setting out traffic signs and cones	GEN 1.11 Traffic Control Procedures
Take secondary voltage readings	LNW 5.06 Overhead Live Line Work – Paralleling Single-Phase Tx
Taking amperage reading	LNE 5.13 Overhead Live Line Work – Working on Neutral Conductor
Using meter stick with hot-pot adapter	LNE 5.25 Underground Live Line Work - Hi-Pot adapter Procedure
Using metering stick	Various

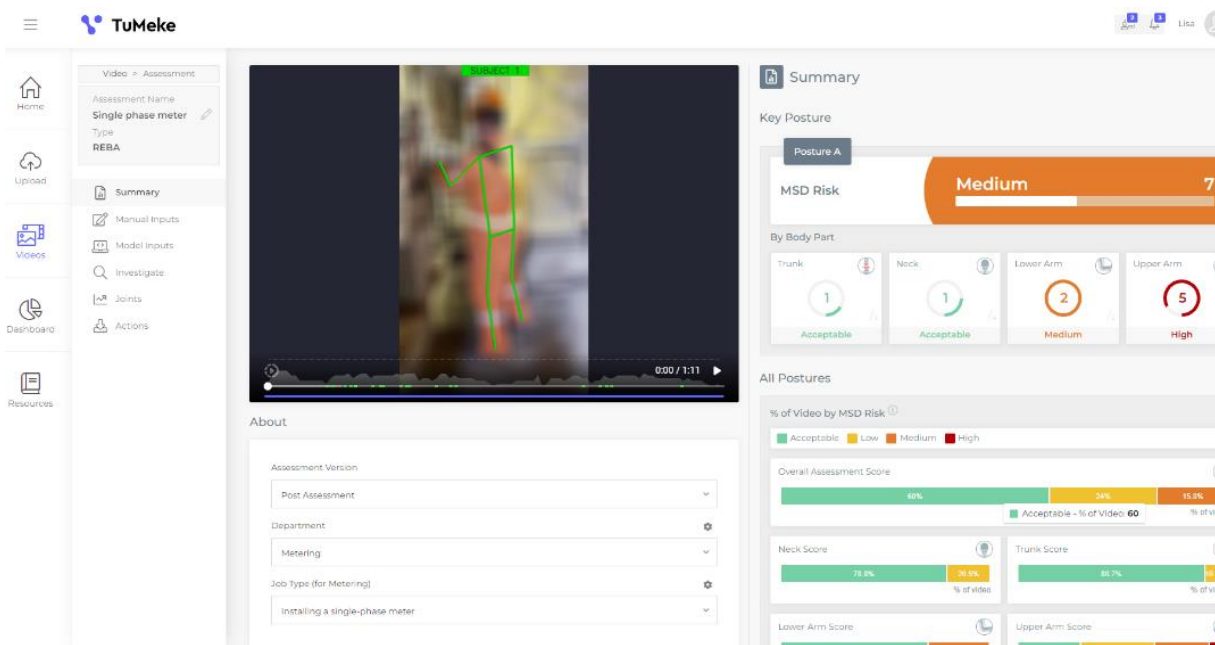
2. Capture and upload field videos – This step required coordination with the Operations department to conduct field visits to take specific videos. This process was voluntary for employees to participate in, yet employees reported positively about being recorded on video. Videos were taken via cell phone by members of the Health and Safety department or supervisors. All videos were then uploaded into the TuMeke system.
3. Analyze and report – Reports were generated and scores for all tasks were uploaded in the TuMeke system. Specifically, the system helped with:
 - Ergonomic assessments – each video was analyzed to identify common ergonomic risks, body parts impacted, and postures that may lead to discomfort or injury.
 - Task evaluation – all tasks were evaluated, pinpointing areas where efficiency and safety could be improved through better techniques or tools.
 - Actionable insights – reports highlighted specific suggestions for modifying tasks, including the introduction of ergonomic tools or changes in workflow to reduce strain.

Impacts

The implementation of computer vision technology resulted in several significant outcomes:

- Video review in safety meetings: Video analysis of job tasks was incorporated into safety meetings to highlight awkward postures, explore alternative methods for task execution, and gather additional suggestions from employees for tools and equipment.
- Action tracking: All corrective actions and recommendations are now documented in a tracking tool for effective follow-up and accountability.
- Mobility program: A stretching initiative to promote physical wellbeing was launched upon conclusion of the grant.

Figure 2. Example of TuMeke Analysis and Reporting Interface



Lessons Learned

Burlington Hydro also noted several important lessons learned that will impact their workforce moving forward:

- Collaborative learning: Reviewing videos during safety meetings has fostered open discussions about awkward postures, encouraging team members to share insights and alternative approaches to tasks.
- Employee engagement: Involving employees in discussions about safety and ergonomics has increased engagement and ownership of their work environment.
- Measurable outcomes: Tracking actions in a structured way allows for the assessment of the program's effectiveness and highlights areas for further improvement.
- Enhanced awareness: The mobility program raised awareness of the importance of stretching and physical health among employees, leading to a culture that prioritizes wellbeing.

Overall, these lessons emphasize the value of integrating computer vision technology into assessment and developing safety practices, leading to a healthier and safer workplace.



Burlington**hydro**

Burlington Enterprises Corporation (BEC) is a services company that is wholly owned by the City of Burlington. Burlington Hydro Inc. (BHI) and Burlington Electricity Services Inc. (BESI) are affiliate companies owned by Burlington Enterprises Corporation. Burlington Hydro serves approximately 68,500 residential and commercial customers in the City of Burlington, delivering electricity into the community through a network of 1,600 kilometers of medium-voltage distribution lines and 32 substations.



TuMeke
Ergonomics

TuMeke is on a mission to eliminate workplace injuries. Their AI-powered platform empowers safety professionals to prevent injuries through automated risk assessments, actionable insights, and measurable results. Reduce incidents and injury-related costs while fostering a strong safety culture with TuMeke.

Contact Us:
msdsolutionslab@nsc.org

Learn More:
nsc.org/msd

 **nsc**
National Safety Council