nsc National Safety Council | MSD Solutions Lab an nsc program

Pilot Grants in Action:

Findings from the MSD Solutions Lab 2024-2025 Grant Program

Table of Contents

Introduction

Musculoskeletal disorders (MSDs) remain prevalent, affecting nearly a quarter of the global population. MSDs are complex in nature, resulting from exposures to **repetitive motions**, **awkward or static postures**, or **forceful exertions** and including issues like tendinitis, back strains and sprains, and carpal tunnel syndrome. MSDs are the most common causes of disability, involuntary retirement and limitations to gainful employment, costing employers billions of dollars every year in workers' compensation and lost productivity.

To address this challenge, the MSD Solutions Lab was established, with funding and support from Amazon, with a mission to reduce the most common workplace injuries by increasing awareness, conducting research, engaging key stakeholders, disseminating research, identifying new technology and solutions, and scaling results so that all workplaces can benefit. Efforts are organized around four core pillars:

- **Engage:** Meaningfully engage employers, workers, researchers and innovators
- **Research:** Conduct impactful, practical research; analyze data; and disseminate insights across industries
- **Solve:** Identify, pilot, scale and promote unique solutions
- **Amplify:** Create a global effort to engage operations and safety leaders across all industries

To deepen the impact of the Solve pillar, grant programs were developed (1) for organizations from the **MSD Pledge** community to have the opportunity to partner with innovative solution providers to trial technologies in real-life applications through the Pilot Grant Program and (2) to develop and research new technologies for MSD prevention through the Research to Solutions (R2S) Grant Program. More information about these grant programs and past pilot and R2S project overviews can be found **here**.

Pilot Grant Program Overview

For the 2024-2025 cycle, mitigation of MSD risk due to upper-extremity work was the intended focus of the pilot projects. According to the **2025 Liberty Mutual Safety Index**, injuries to upper extremities (i.e., shoulder, wrist, hand, elbow, forearm) cost U.S. employers over $17 billion in 2022. Shoulder injuries specifically cost employers $7.68 billion and were the second most costly injury behind back injuries.

Solution providers eligible for the grant program were highlighted during the 2023 NSC Safety Congress & Expo as part of the Safety Innovation Challenge, which aims to promote innovative strategies for preventing MSDs in the workplace. MSD Pledge organizations applying for grants were allowed to choose from solutions providers from the Safety Innovation Challenge or could consult the MSD Solutions Lab to determine what might be their best fit given their MSD risks and prevention goals. Selected solution providers were tasked with assisting their industry partner in reducing the risk of workplace MSDs. Upon completion of the grant, grant recipients were expected to present their findings at the 2025 annual NSC Congress & Expo.

Eligible Solution Providers and Technology Descriptions for the 2024-2025 Pilot Grant Program Cycle

Feraru Dynamics LTD HAV-Sentry Glove	A sensor-equipped, wearable device that measures hand-arm vibration and protects tool operators from developing hand-arm vibration syndrome.
Bioservo Ironhand	A wearable technology that strengthens the human grip, allowing operators to use less grip force when performing repetitive tasks, thus reducing fatigue.
Reactec	A smartwatch with sophisticated sensor and software technology that measures the risk of exposure to hand-arm vibration in real-time.
LifeBooster	An advanced multipoint sensor system and Senz™, a data analysis platform, collect accurate, dynamic data, thus prioritizing and deploying preventative measures against MSDs.
3motionAI	A markerless motion technology combined with artificial intelligence gives employers actionable insights into injury risk prediction based on the physical demands of a job.
Hilti	A wearable exoskeleton that helps relieve shoulder and neck fatigue when working above shoulder level and is ideal for continuous or repetitive overhead tasks.

Brief Description of 2024-2025 Grant Projects

Four teams made up of an MSD Pledge organization and solution provider were awarded a pilot grant:

- **Superior Tube Products** (Davenport, Iowa, USA) partnered with 3motionAI and used its video motion capture technology to quantify the impact of existing safety programs and create an enterprise evaluation of risk and actionable data to drive ergonomic solutions for all employees
- **Ocean Spray Cranberries** (Babcock, Wisconsin, USA) worked with Feraru Dynamics LTD to measure and mitigate hand-arm vibration exposures among power tool operators
- **PepsiCo Global Concentrates Solutions** (Arlington, Texas, USA) teamed up with LifeBooster to collect and analyze ergonomic risk data and identify upper-extremity MSD mitigation strategies
- **Wonderbrands** (Langley, British Columbia) partnered with LifeBooster to identify ergonomic risks caused by upper-extremity work and heavy lifting, in addition to evaluating in-house capabilities for digitized risk assessments to help reduce injuries

This report provides an overview of the findings from the 2024-2025 pilot grant projects. Each project description will be presented in a case study format, detailing project aims, implementation processes, challenges, accomplishments and lessons learned. The objective is to document the experience of the grantee organizations that have worked with technology providers to test innovative solutions and highlight barriers and successes that may be applicable to mitigating MSD risk for other workplaces.

Case Study 1:

Superior Tube Products and 3motionAI

What's the Risk?

Superior Tube Products, now part of Morton Industries, was a manufacturer of fabricated welded tubular assemblies and identified MSDs as a persistent driver of injuries, particularly in the wrist, elbow, shoulder and lower back. These injuries stemmed from awkward reaches, repetitive motions and manual handling across high-mix production cells such as tube bending, laser operations, punching and pressing, and wash processes. Historically, Superior Tube's approach to ergonomics was largely reactive. Issues were often addressed only after discomfort had escalated, and hazard identification depended heavily on informal observation rather than structured, objective data. Employees frequently worked through soreness, and supervisors relied on intuition to recognize ergonomic concerns.

In 2022, the company began taking important steps to shift away from this reactive model. The company created a dedicated safety function and launched a more proactive strategy focused on prevention. Early reporting expectations were introduced, enabling employees to share concerns at the first sign of discomfort. Job safety analyses were formalized, leadership walk throughs became routine, and overall participation in safety processes increased. These efforts revealed that while engagement was improving, the organization still lacked clear ergonomic insight based on measurable data. MSDs remained a leading contributor to injuries, and the existing tools made it difficult to distinguish between perceived and actual risk.

Challenges with new-hire acclimation and fluctuating production cycles added further complexity, making it difficult to consistently identify high-risk tasks. To progress from assumption-based prevention to evidence-based prevention, the organization needed a scalable way to understand where ergonomic risk was truly present, task by task and cell by cell, and to coach safer movements in real time without requiring in-house ergonomists for every assessment.

Project Aims

Superior Tube Products partnered with 3motionAI to integrate its Flashlight tool (video capture using a cellphone) and RiskAI dashboard (AI-driven motion analytics) with the following goals:

- Identify and mitigate key MSD risk factors affecting the upper quadrant (shoulder, elbow, hand) and the lower back for both new hires and existing employees
- Evaluate how 3motionAI technology can strengthen and quantify the impact of existing safety programs
- Create an enterprise-level view of ergonomic and musculoskeletal risk across all work cells
- Generate actionable data to guide improvements in movement patterns, task design and ergonomic solutions for the entire workforce

Description of Project Activities and Implementation

Superior Tube Products piloted 3motionAI's Flashlight and RiskAI tools for approximately eight months (May 2024-January 2025). The project included four main components, each contributing to a clearer and more data driven view of MSD prevention.

Onboarding and Training

The project began with hands-on onboarding provided by 3motionAI, which ensured that Superior Tube's leadership and supervisors were prepared to use the technology effectively. A 3motionAI representative visited the facility to coach the team on the fundamentals of capturing reliable assessment footage using the Flashlight tool. This included instruction on camera positioning, lighting, angles and the importance of following the operator's workflow in real time. The training equipped supervisors to confidently collect consistent, high-quality videos and laid the foundation for accurate and repeatable ergonomic assessments.

Video Capture of High-Risk Tasks Using the Flashlight Tool

Once trained, the safety team and supervisors conducted targeted video capture across work cells with known or suspected ergonomic risk. These sessions focused on representative tasks within tube bending, laser operations, wash-bay activities and associated material handling activities. Footage was taken during typical production cycles, even when operating windows were limited due to fluctuating schedules. Despite the intermittent nature of production, the team strategically captured tasks when product lines became active, ensuring that real conditions were reflected in the dataset.

Figure 1. *Image depicts video capture from a cellphone using the 3motionAI Flashlight tool*

Data Analysis Using the RiskAI Dashboard

Uploaded videos were analyzed through the RiskAI dashboard, which generated movement scores, joint-level risk metrics and visual heatmaps capturing factors such as shoulder elevation, trunk flexion, reach distance and task duration. Throughout the project, the team at Superior Tube Products worked closely with 3motionAI to interpret these results and deepen internal understanding of movement patterns. The team also collaborated with the provider to reorganize the system's dashboard structure so that work centers and tasks aligned with the organization's operational layout. This adjustment made the tool more intuitive, increased adoption across leadership, and strengthened the connection between analytic outputs and real-world workflows.

Figure 2. *A task video is captured, analyzed through the 3motionAI engine and generated into ergonomic risk insights displayed in the RiskAI dashboard*

TASK	EMPLOYEE	STATUS	DATE	UPPER	LOWER	OVERALL
Wash Outer	Operator (RO) Bending	Completed	Jun 26, 2025	47	0	24
Wash Inner Tube	Operator (RO) Bending	Completed	Jun 26, 2025	37	0	18
Unload Bender	Operator (BB) Bender	Completed	Jul 9, 2025	31	0	16
Load Base and Legs	Operator (AP) Welder	Completed	Jun 18, 2025	31	15	23
Remove Part From Fixture	Operator (KH) Welder	Completed	Jun 18, 2025	31	14	22
Punch and Grind	Operator (BB) Bender	Completed	Jul 9, 2025	26	23	24
Weld Base Back	Operator (KH) Welder	Completed	Jun 18, 2025	25	0	12
Top Weld	Operator (AP) Welder	Completed	Jun 18, 2025	22	19	20
Lift to Fixture	Operator (KH) Welder	Completed	Jun 18, 2025	22	0	11
Wash Outer Solution (Shorter Wand)	Operator (RO) Bending	Completed	Jun 26, 2025	22	7	14

Figure 3. *RiskAI dashboard showing completed risk assessments for various tasks*

Development and Evaluation of Data-Driven Safety Improvements

The insights from RiskAI guided Superior Tube's continuous improvement efforts. Findings were reviewed during safety huddles and follow-up coaching sessions, where operators and supervisors discussed opportunities to modify techniques, reposition tools or adjust workflows. The team emphasized low-cost, high-impact fixes first, such as changes to tooling or minor adjustments to workstation layouts. As the project progressed, these targeted improvements helped validate assumptions, uncover hidden risks and reinforce a more proactive safety culture rooted in data rather than observation alone.

Project Challenges

The project was shaped by unforeseen circumstances that required the team to adapt its approach and rethink priorities. A gradual slowdown in production at the beginning of the project reduced the number of consistent work cycles available for ergonomic assessments, making it difficult to capture representative baseline and follow-up data for all work cells. This was compounded by updates to the Flashlight and RiskAI tools early in the project, as scoring methods, data structure and filtering capabilities evolved before complete baseline data could be established. These changes affected data consistency and the ease of establishing clear priorities of ergonomic risks. These constraints pushed the project to focus on high-risk areas identified by Superior Tube's Early Reporting System and then supported by tool-based data. The team shifted focus to the top-reported areas, and the pilot still produced meaningful insights, strengthened Superior Tube's understanding of ergonomic risks and demonstrated that meaningful ergonomic improvements do not always require major expenses.

Project Accomplishments and Lessons Learned

Project accomplishments centered on improved prioritization of risky tasks and included the following:

- **Objective risk visibility and prioritization:** The Flashlight video capture tool and RiskAI dashboard provided objective measures of risk exposure for tasks and associated postures, revealing what truly drove risk exposure and allowing for more focus on high-value fixes instead of perceived problem areas. For example, the team initially assumed heavy-tubing operations carried the highest risk. Analysis showed those operators used effective techniques and aids, while the wash bay was the real driver of exposure due to an overly long wash wand that forced sustained shoulder elevation and extended reach.
- **Engagement with workforce to develop effective solutions:** Employees reported enjoying receiving feedback through movement scores and learning how small adjustments could improve comfort. Supervisors gained confidence using the data to coach teams, and leadership began using risk analytics to support planning discussions about workflow, workstation setup and equipment needs. Reviewing results with operators and supervisors led the team to implement a shorter wash wand that cost about $45, required no sweeping process changes and immediately reduced shoulder strain. Operators reported feeling more comfortable, and the job became easier and more natural to perform.

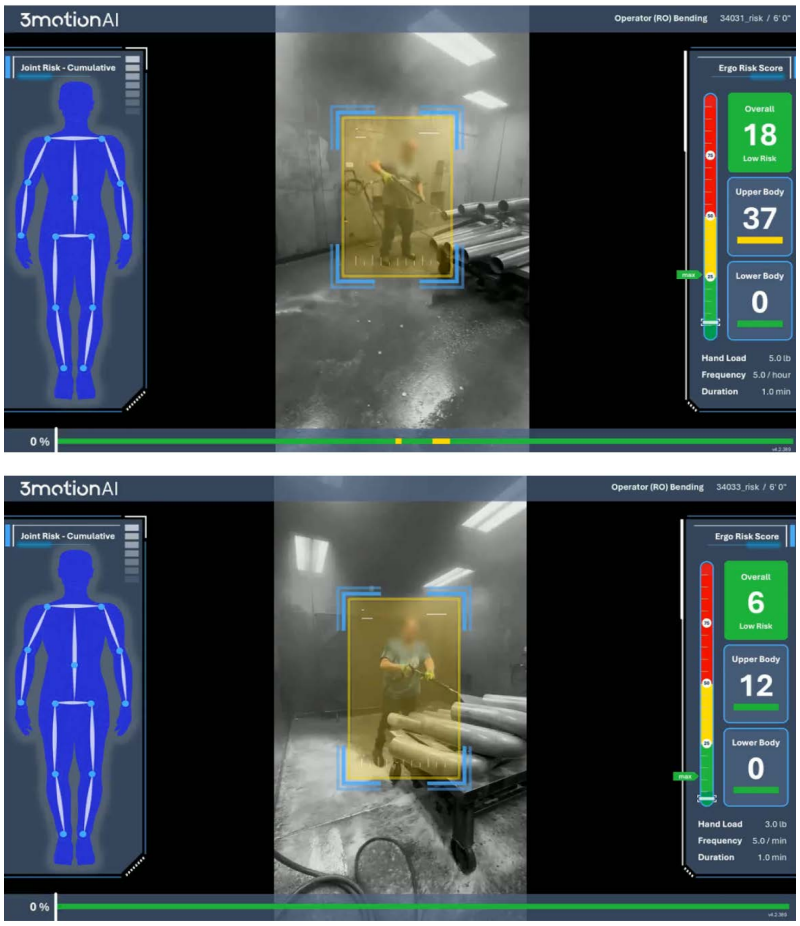


Figure 4. *Images depict the upper body Ergo Risk Score before and after implementing a shorter wash wand*

- **Risk Priority Numbers established:** RPNs were created to rank tasks and sequence improvements.
- **Injury reduction:** The total recordable incident rate decreased by 60% in one year.
- **Cost impact:** Workers' compensation costs dropped by over 98% across three years.
- **Insurance benefits:** The experience modification rate decreased by 36%, reflecting improved safety performance with reduced insurance risk and costs.

Beyond these accomplishments, the pilot also generated valuable learnings that strengthened Superior Tube's safety culture and informed future ergonomic improvements. The team saw firsthand that assumptions about tasks with the highest risk are not always accurate. For example, tasks involving heavy parts were not always the highest-exposure tasks, and factors such as reach patterns, duration of tasks and repetition often mattered more than load alone. These findings reinforced the importance of measuring risk before investing, and the pilot showed that short videos, representative of real production demands paired with analytics, were enough to accurately identify true exposure drivers. The pilot also highlighted how small, low-cost design tweaks, such as adjusting tool length, fixture position or part-presentation height, can meaningfully, quickly and affordably reduce shoulder and back strain.

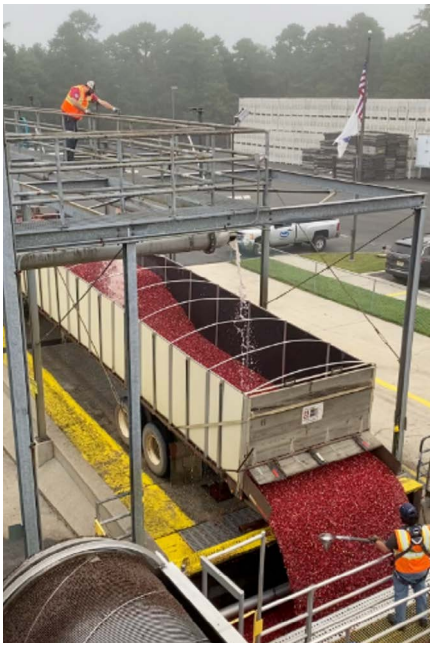
Lastly and importantly, the project reaffirmed that solutions come from the people who do the work. Frontline insights, combined with data, often surface the most effective fixes, as illustrated by the wash-bay wand change. Sharing the captured video and data analytics with affected employees allowed for collaboration and brainstorming to develop ideas for solutions.

Case Study 2:

Ocean Spray Cranberries and Feraru Dynamics LTD HAV-Sentry Glove

What's the Risk?

At Ocean Spray Cranberries, more than 500,000-700,000 wooden bins are used annually to transport, freeze, store and process harvested cranberries. These bins undergo repeated cycles of filling, dumping, freezing and handling, which leads to frequent structural damage requiring repair. Approximately 100 employees across receiving stations and plants perform bin repairs using high-vibration power tools, including vibratory saws, grinders and other handheld equipment.



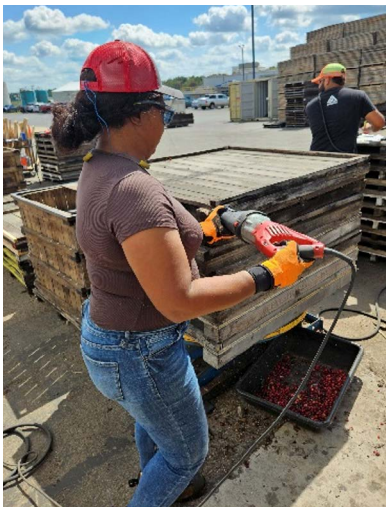


Figure 5. *Scenes from Ocean Spray's cranberry operations, highlighting the volume of wooden bins in use and the manual, tool intensive repair tasks performed by employees*

Workers have historically reported symptoms consistent with hand-arm vibration syndrome (HAVS) (e.g., persistent tingling/numbness, reduced grip strength, and "vibration white finger" or finger blanching), particularly from vibratory saw use. Yet exposure mitigation relied largely on employee complaints, reactive rest regimens and inconsistent adherence to standard operating procedures.

The combination of high-amplitude vibration tools, repeated long-duration cuts, variable techniques among operators and limited real-time feedback created the conditions under which HAVS risk remained elevated. Ocean Spray sought a data-driven method to measure, visualize and control exposure to prevent chronic injuries related to HAVS and improve work practices.

Project Aims

Ocean Spray partnered with Feraru Dynamics LTD to pilot the HAV-Sentry wearable glove system with the following aims:

- Quantify vibration exposure among workers performing high-risk vibratory tool tasks during bin repair
- Identify root causes of elevated exposure by correlating vibration peaks with worker technique through matched video analysis
- Coach employees using objective data, improving adherence to safe tool handling procedures and reducing improper cutting behaviors
- Reduce overall vibration exposure, and minimize the likelihood of HAVS over time

These aims were designed to transition Ocean Spray from a reactive model to a proactive, evidence-based exposure management program.

Description of Project Activities and Implementation

From November 2024 to August 2025, the HAV-Sentry system was deployed at the Babcock, Wisconsin, Ocean Spray receiving station, a facility where wooden bin repairs are performed. Employees wore HAV-Sentry gloves while operating vibratory saws and other high-vibration tools as part of their normal workflows.

Sensor Wear

Workers wore HAV-Sentry units integrated into textile gauntlets designed to continuously monitor hand-transmitted vibration. The embedded Aegis sensing modules captured real-time vibration amplitude, frequency and exposure duration as experienced directly by the hand. The system calculates exposure continuously and provides visual or audible alerts when vibration approaches recognized safety thresholds (as defined in ISO 5349–1:2001):

- **EAV (Exposure Action Value):** 2.5 m/s² over eight hours – level requiring employers to take action to reduce exposure
- **ELV (Exposure Limit Value):** 5.0 m/s² over eight hours – maximum allowable daily exposure requiring immediate intervention if exceeded

Figure 6. *Image depicts an individual wearing the HAV-Sentry glove and completing a task*

Video Matched Analysis

After each session, exposure data were downloaded and reviewed through the HAV-Sentry online dashboard, which automatically flags periods when workers neared or exceeded the EAV or ELV. These flagged intervals were then matched to synchronized camera footage, allowing the team to pinpoint the exact motion, grip or saw-handling behavior associated with the elevated readings. This process revealed clear correlations between improper tool handling and spikes in vibration exposure.

Coaching and Work Practice Improvement

Supervisors used the combined dashboard data and video evidence to deliver targeted, precision coaching. This helped workers visualize how their technique deviated from standard operating procedures and how specific behaviors contributed to overexposure. Coaching emphasized grip force, cutting posture, saw engagement technique and blade selection. Additionally, the work practices of the lowest-exposure employees were used as models for the highest-exposure employees.

Project Challenges

There was some resistance to wearing the HAV-Sentry glove to measure vibratory exposure, though it was a minor issue. The additional layer of the HAV-Sentry glove underneath the work glove caused discomfort for some workers. Additionally, early units had a wired link between the palm sensor and dorsal recorder, which workers found restrictive. Feraru Dynamics has since revised the design to resolve this issue.

Project Accomplishments and Lessons Learned

The project accomplished a great deal and generated insights that Ocean Spray can continue using to reduce HAVS risk. Key accomplishments and lessons learned include the following:

- **Objective identification of improper tool use:** Video matched with sensor data made it immediately clear when vibration peaks aligned with incorrect cutting technique, enabling supervisors to target the exact movement patterns contributing to HAVS risk.
- **Significant reductions in vibration exposure:** Over the pilot period, elevated vibration readings decreased by 50% as coaching improved operator technique and workers became more aware of risk factors.
- **Increased employee awareness and skill:** Before the pilot, employees knew little about HAVS; afterward, all participants were better trained on HAVS risk and proper vibratory saw technique. The technology allowed workers to clearly see the specific actions producing elevated vibration exposure, strengthening the impact of coaching.
- **Identification of additional best practices:** The pilot highlighted the value of using vibration-dampened blades, securing bins to reduce resonance, initiating cuts slowly to limit kickback, and maintaining proper holding technique by letting the tool do the work rather than applying excessive grip force or pressure. The sensor data also helped inform job rotation frequency.
- **Dissemination across the organization:** Findings were shared with all Ocean Spray facilities performing bin repair and across its broader environmental health and safety network.

Overall, this project successfully demonstrated how real time, wearable vibration monitoring combined with video matched analysis can transform hand-arm vibration management from a reactive to a proactive, data driven process. The pilot achieved meaningful reductions in high risk vibration exposure through targeted coaching and improved work practices and also increased employee awareness, engagement and skill related to HAVS prevention.

Case Study 3:

PepsiCo and LifeBooster

What's the Risk?

Across PepsiCo Global Concentrates (PGCS), MSDs represent the highest category of recordable injuries and account for more lost workdays than any other injury type. In particular, work-related MSDs involving the back and shoulders are the top contributors, underscoring the significant physical demands placed on frontline employees.

At the local facility level, specifically the PGCS Arlington site, workers are exposed to high risk ergonomic conditions due to the physically demanding nature of their roles. Tasks often require prolonged periods of repetitive manual material handling, with frequent upper extremity motions involving shoulder flexion and abduction and rotation and forward flexion of the trunk. Frontline teams have specifically reported discomfort associated with operations such as salts automated storage and retrieval system (ASRS), liquid batching, sanitation, and maintenance.

Given the organizational prevalence of MSDs and their operational impacts, effective identification, assessment and mitigation of ergonomic risk factors is a critical priority for PGCS. The team prioritizes strategies that focus on prevention and proactive mitigation through equipment, tool and process redesign due to the potential risk-reduction impacts. To align with these priorities, the PGCS Arlington site sought a scalable, data driven method to quantify exposure, prioritize controls and validate impact over time.

Project Aims

PGCS Arlington partnered with LifeBooster to utilize its wearable sensors and data analytics platform. The specific goals were to:

- Develop a representative baseline of ergonomic exposure across targeted workgroups (Salts ASRS, Liquids Batching, Sanitation and Maintenance)
- Identify which job demands and conditions contribute most to elevated risk
- Generate and prioritize effective risk controls
- Prepare for and begin validation of selected interventions

Description of Project Activities and Implementation

The pilot project took place from July 2024 to September 2025 at the PGCS site in Arlington, Texas, though PGCS has continued its partnership with LifeBooster, and validation work is ongoing. The project centered on deploying LifeBooster's wearable sensors to collect full shift exposure data, analyze risk patterns across four key workgroups and develop a prioritized set of controls for MSD risk reduction. The project followed a structured, data driven workflow that included baseline assessment, analytics review, collaborative solution development and early-stage validation of selected interventions.

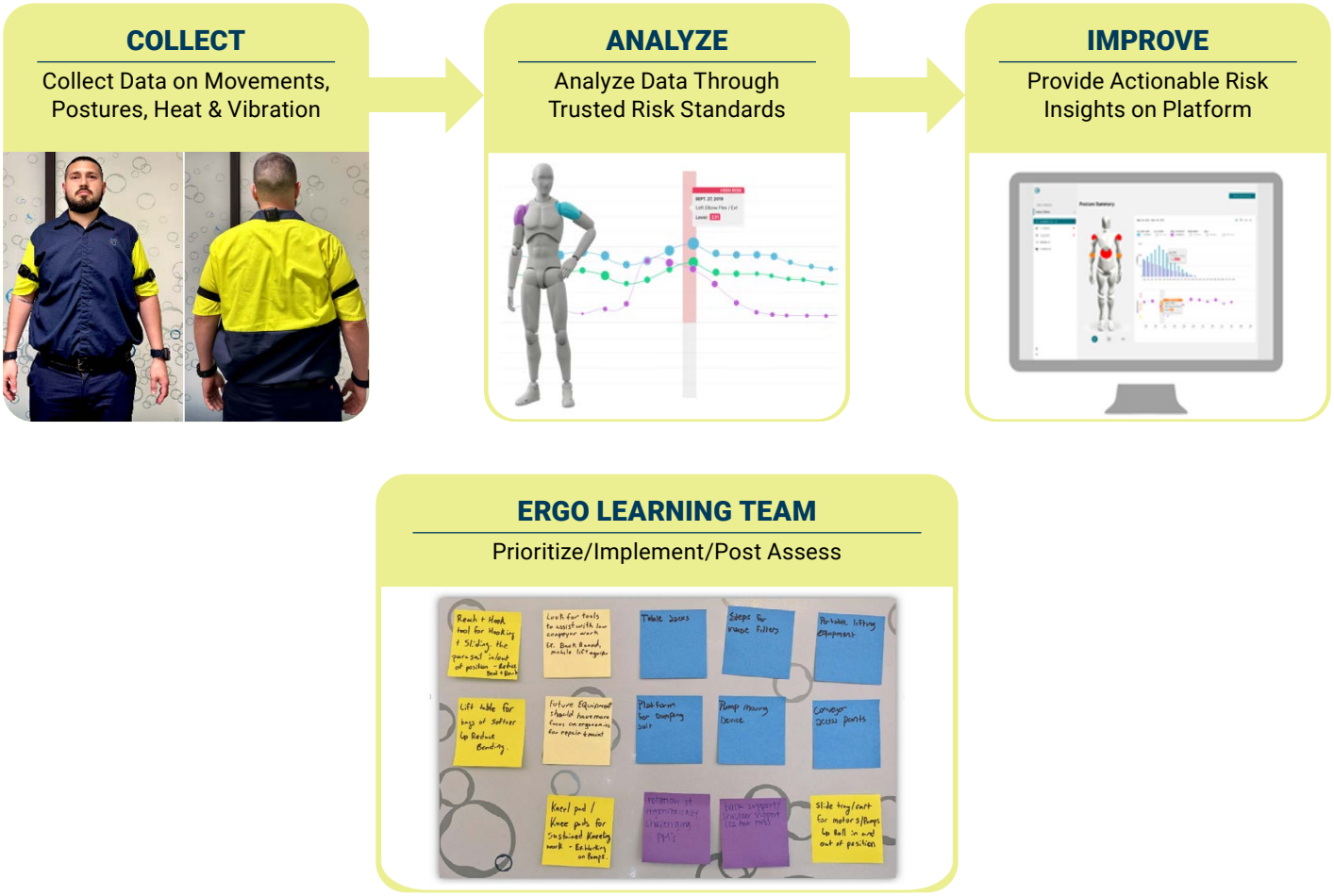


Figure 7. *Project workflow included data collection using wearable sensors, data processing and insights generated on the LifeBooster dashboard platform, and ergonomic learning teams to collaboratively discuss findings and prioritize solutions*

Training Sessions with LifeBooster

Early in the initiative, the LifeBooster team provided hands-on sessions to the EHS (environment, health, and safety) team at PGCS, covering technology setup, data collection protocols and interpretation of results. These sessions equipped participants with the technical skills necessary to accurately and consistently conduct assessments. As the project progressed, LifeBooster offered ongoing coaching and support and resources to roll out a train-the-trainer approach to onboard new team members and ensure continuity amid staffing changes. Each participant received individualized guidance to maintain high-quality data collection and a clear understanding of project goals and analytical approaches. Through this structured training, the team developed the capability to collect, analyze and interpret data at scale, strengthening expertise on the EHS team.

Full-Shift Baseline Assessments Across Four Workgroups

The project launched with a comprehensive baseline data collection effort, capturing full shift assessments with the wearable sensors across the Salts ASRS, Sanitation, Liquids Batching, and Maintenance workgroups. These assessments generated over 664 hours of ergonomic exposure data, representing a wide range of worker characteristics (e.g., height, tenure), shift types and equipment configurations.

Table 1. Summary of baseline data collection by job group

Risk Baselining for Target Workgroups	Completed Assessments
Arlington, TX	**82**
Salts ASRS	**30**
Day Shift (1st)	16
Afternoon Shift (2nd)	14
Salts Sanitation	**12**
Night Shift (3rd)	12
Liquids Batching	**15**
Day Shift (1st)	6
Afternoon Shift (2nd)	9
Maintenance	**25**
Day Shift (1st)	15
Afternoon Shift (2nd)	10

Data Analysis and Risk Interpretation

After baseline data collection, the PGCS team partnered with LifeBooster to conduct structured analysis sessions reviewing exposure trends at both the job group and aggregate levels. These sessions identified leading contributors to MSD risk, including back flexion/extension, back side bending and repetitive upper body demands. They also highlighted risk variations between day and night shifts, particularly across the Sanitation and Maintenance groups.

Ergonomic Learning Team and Solution Generation

Following the baseline review, the site launched a cross functional ergonomic learning team composed of EHS team members, supervisors, frontline workers and operational support staff. This group contextualized the sensor findings with on the floor insights, generating 38 potential control ideas ranging from workstation adjustments to tooling and process interventions.

Prioritization and Validation of Controls

The ergonomic learning team used a structured process to prioritize the 38 generated control ideas, considering the following for each control: the number of activities impacted, projected potential impact, feasibility and priority ratings from the team. The team selected and implemented four high-priority ergonomic controls and conducted reassessments to validate their effectiveness against baseline exposure levels. The quantification of impact of the selected interventions is currently underway, with the project continuing beyond the grant period and the PGCS Arlington site having renewed its contract with LifeBooster.

Project Challenges

The project remained on schedule despite several challenges:

- Technology access issues arose early due to firewall restrictions. IT support resolved these by configuring dedicated connectivity access.
- The high volume of assessments introduced considerations for sanitation and equipment turnover, particularly in a food manufacturing environment where compliance with food manufacturing standards is required. With input from the quality control and site teams, a clear process was established, allowing equipment rotation and cleaning to run smoothly while supporting consistent data quality.
- Sensor placement consistency was an early issue due to the high volume of assessments, but refresher training and guidance materials improved placement reliability.
- Limited availability for frontline workers to participate in the learning team occurred due to production schedules, yet sessions remained highly productive, yielding a robust set of viable control ideas.

Project Accomplishments and Lessons Learned

The team had several accomplishments and gained insights during the grant period.

- **Completion of comprehensive, representative baseline risk assessments:** Eighty-two full-shift risk assessments were completed with the wearable sensors across four high-risk workgroups. This resulted in the capture of 664+ hours of exposure data, enabling high-confidence analysis and equipping the team with an objective basis for prioritizing certain risks and controls.
- **Identification of highest-risk roles and contributors to risk:** Findings from the baseline assessments indicated variability in risk by job role, movement type and shift:
  - Sanitation, salts ASRS and batching operator roles were identified as the highest-risk jobs, each showing elevated exposure to repetitive upper-body movements, manual material handling and trunk-focused postures. Maintenance roles were shown to have lower risk comparatively, though they are still exposed to some risk due to nonstandard postures, cramped spaces and the reactive nature of troubleshooting tasks.

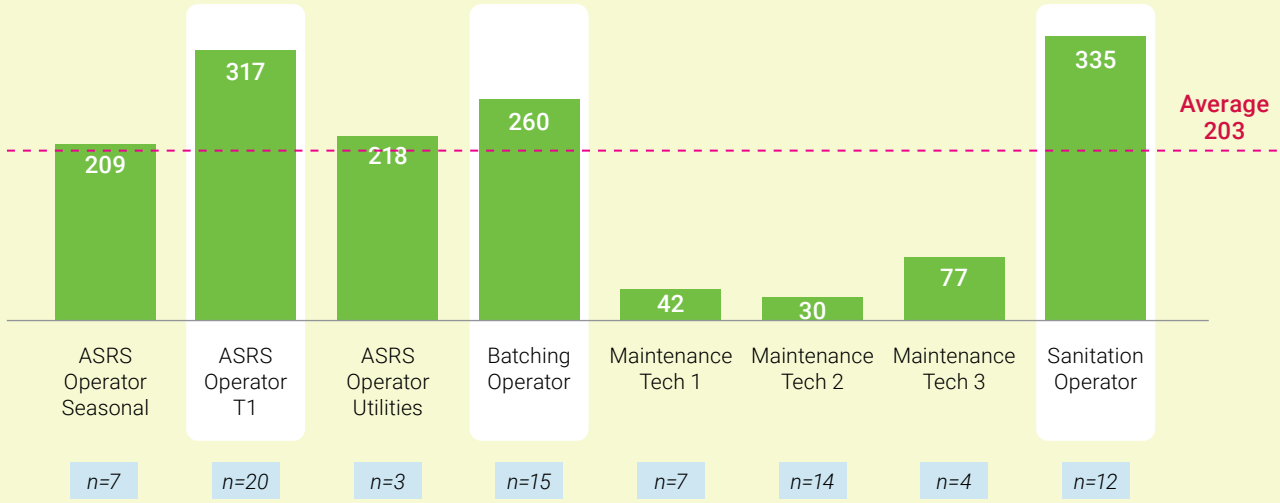


Figure 8. *Relative risk exposure by job type: Sanitation, Salts ASRS and Batching operators had higher risk exposure scores (209-335) compared to the average (203), while maintenance roles had lower-than-average risk scores (30-77)*

- Across all job roles, the most significant contributors to repetitive strain risk were back flexion/extension and back side bending.
- Night-shift workers experienced higher overall risk exposure than day-shift workers, likely due to workflow pacing, staffing patterns and less equipment availability during off-hours.

- **Ergonomic learning team collaboration to create an extensive control catalog:** The formation of the ergonomic learning team brought together individuals from different departments and provided a structured forum for knowledge sharing and collaborative problem solving. Participants gained exposure to diverse perspectives and operational contexts, supporting cross-functional collaboration and a more holistic understanding of workplace ergonomics. Collaborative data review sessions and workshops also allowed participants to deepen their understanding of risk analysis, operational factors influencing outcomes and technology-enabled assessment. These activities encouraged critical thinking and practical application of insights to optimize processes and strategies.
- **Creation of an extensive control catalog:** The ergonomic learning team generated 38 distinct ergonomic control ideas, which far exceeded expectations for the project stage. These ranged from equipment changes and adjustments to administrative controls such as job rotation, dynamic warm-ups and review of proper lifting techniques.

- **Implementation of controls and improved capability to measure impact:** The site now has the ability to directly measure change in risk exposure after the implementation of controls. The team implemented four prioritized controls, including pallet leveller tension adjustments and the introduction of a hose attachment for the sanitation team to reduce bending and awkward postures during cleaning tasks, and reassessments are currently underway to quantify the impact by comparing post-control exposure levels against the baseline. A smaller group from the learning team continues to meet monthly to review progress and next steps and regularly provides updates to the rest of the team on validation efforts.

Overall, this project supported knowledge-sharing activities that emphasized both practical application and cross-functional collaboration. Additionally, as the site gained familiarity with the LifeBooster platform and reviewed early baseline insights the team identified opportunities to extend data collection beyond the four originally targeted groups. For example, additional assessments are being conducted for office and logistics roles. PGCS Arlington is continuing its work with LifeBooster beyond the grant cycle and continues to implement and validate controls to further ergonomic improvement.

Case Study 4:

Wonderbrands and LifeBooster

What's the Risk?

Wonderbrands is a leading producer of fresh baked goods, and the production of bread and bakery goods exposes workers to a variety of ergonomic risks stemming from ingredient handling, production tasks, workstation setup and the natural variability in how work is performed:

- **Heavy lifting:** Workers frequently lift and transport heavy ingredient containers, creating elevated forces on the back, shoulders and upper extremities
- **Repetitive motions:** High frequency motions such as stirring, mixing, shaping, transferring and packaging introduce repetitive stress to the wrists, elbows, shoulders and trunk
- **Awkward postures:** Many tasks require reaching into deep vats, leaning across wide equipment surfaces, bending forward at tables or lifting tools from awkward positions
- **Inadequate workstation design limitations:** Fixed or nonadjustable workstations often fail to accommodate differences in worker height and reach, increasing strain and forcing workers to adopt compensatory postures that heighten MSD risk
- **Work as imagined vs. work as performed:** When workers adapt or deviate from written procedures to meet real production demands, those adaptations can introduce unseen ergonomic risks and efficiency losses

At the Wonderbrands bread and bakery facility in Langley, British Columbia, the Health and Safety team, guided by Human and Organizational Performance (HOP) principles, focuses on understanding work as it is truly done. Through this lens, the team recognized that its in house capabilities were limited – both for conducting systematic ergonomic risk assessments at scale and for understanding the actual risks associated with tasks as performed in the workplace.

Project Aims

To address this limitation, Wonderbrands partnered with LifeBooster to deploy wearable sensors and leverage data analytics with the following aims:

- Reduce manual data collection time by establishing in-house capability to perform digital ergonomic risk assessments at scale using wearable sensors
- Develop a comprehensive risk baseline by quantifying and visualizing MSD risk exposures across all major production areas
- Build awareness and understanding of risk interpretation and continuous improvement among the site team through collaborative review sessions and ergonomic learning team workshops

Description of Project Activities and Implementation

The project was conducted at the Langley bread and bakery facility from July 2024 to January 2025 with the goal of using wearable sensor technology to better understand real world ergonomic risk and to build sustainable internal assessment capability. The project followed a structured sequence: onboarding and training, full shift baseline data collection, preliminary risk analysis, and preparation for ergonomic learning team engagement.

Onboarding, Training and Capacity Building

The initiative began with an onsite kickoff and training session, during which LifeBooster trained Wonderbrands site leads and support staff in use of the wearable sensors, assessment procedures and data interpretation. Training followed a train-the-trainer approach to build local capacity, enabling the Langley site team to independently execute assessments.

Baseline Data Collection Across Eight Job Categories

Following training and deployment of the sensors, the Wonderbrands Langley team conducted an extensive data collection effort, capturing over 829 hours of motion data across 112 assessments and generating a robust, representative ergonomic exposure baseline. These assessments spanned eight primary job categories: bread line, roll line, bread packaging, roll packaging, scaling, shipping, receiving and sanitation.

Table 2. Summary of baseline data collection by job group at Wonderbrands Langley

Department	Job	Target Number of Assessments	Completed Assessments
Production	Bread Line	15	15
Production	Roll Line	15	15
Production	Bread Packaging	15	15
Production	Roll Packaging	15	15
Production	Scaling	10	10
Shipping	Shipper	20	22
Receiving	Receiver	10	10
Sanitation	Sanitor	10	10
		110	**112**

Analysis of Exposure Patterns and Risk Factors

The resulting dataset was processed and analyzed to identify meaningful risk patterns. Significant exposure variability emerged across job types, shifts and body regions. Early analyses also suggested higher exposures during certain shifts, likely related to task demands and production volume.

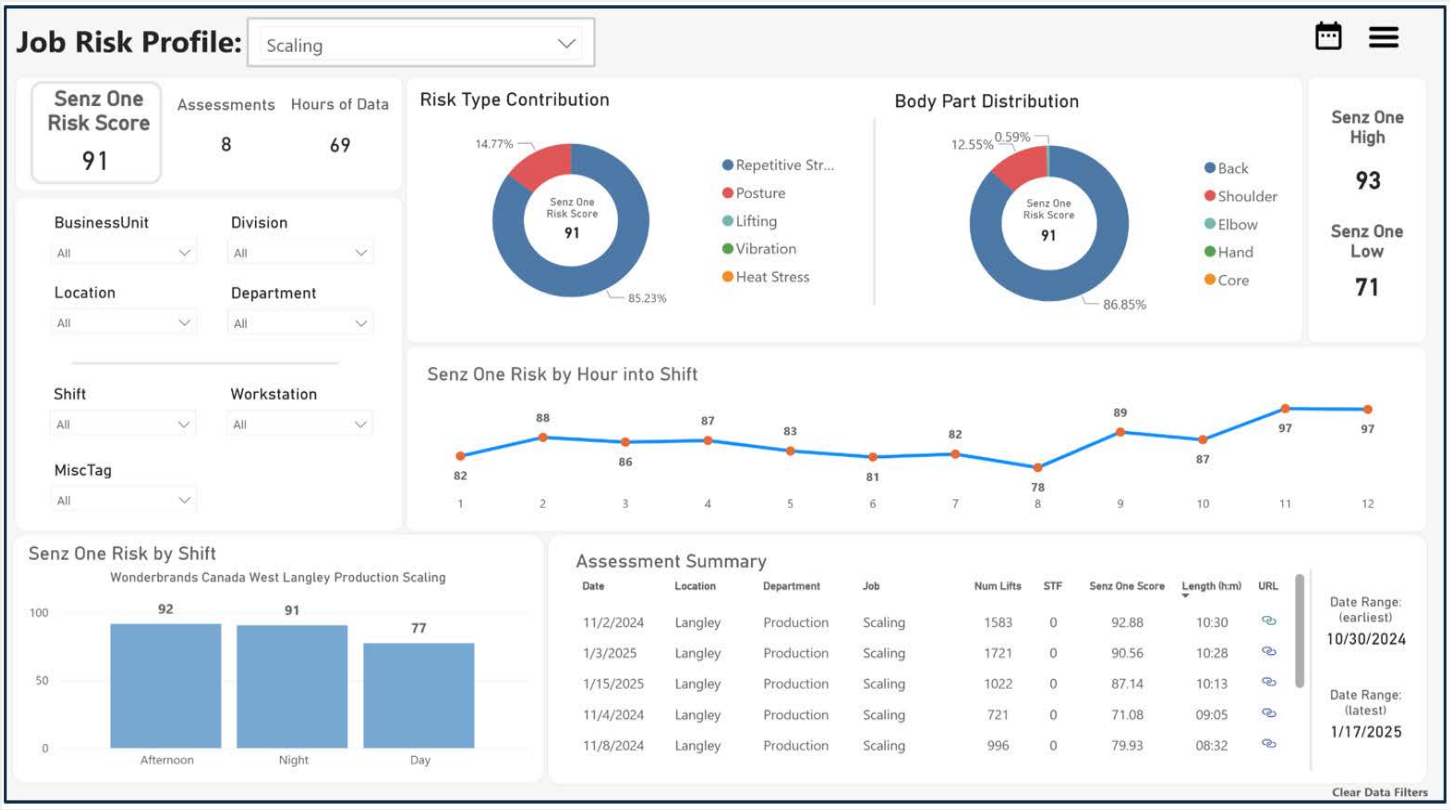


Figure 9. *Example LifeBooster data analytics for scaling job role*

Project Challenges

Throughout the grant period, the Health and Safety team experienced significant staff turnover, including the departure of several key site leads involved in project coordination and data collection. These transitions required reassigning duties, onboarding new personnel and rebuilding project momentum, which contributed to delays in later phases of work. To maintain continuity during these changes, the LifeBooster team proactively onboarded and trained each new site lead and offered remote coaching, ensuring they were fully briefed on project objectives, data collection procedures and progress to date. This consistent support helped stabilize project operations and enabled the site to complete all baseline assessments and achieve the key data analysis deliverables despite limited and shifting resources.

While the project achieved its data-gathering and analysis goals, the next phase – conducting ergonomic learning team sessions to develop risk controls – has not yet moved forward due to ongoing team transitions and limited resources at the site.

Project Accomplishments and Lessons Learned

Despite challenges, the project delivered several meaningful and measurable achievements that advance the site's ergonomic understanding and readiness for long-term MSD prevention.

- **Efficient completion of a comprehensive, baseline ergonomic assessment:** The team captured 112 assessments via wearable sensors across eight production job groups, creating a statistically robust risk baseline. The use of wearable sensors achieved a 95% reduction in data collection time compared to traditional observational methods, collecting over 800 hours of objective motion data in just four hours of onsite time.
- **Insight into work as performed:** The wearable-based approach provided visibility into how tasks are actually executed under production conditions, including operational constraints and worker adaptations.
- **Clear identification of highest risk roles and body regions:** Findings from the baseline assessments indicated variability in risk by job role, body part and shift:
  - **Exposure variability by job:** Bread line and roll line operators, along with those in scaling job roles, exhibited the highest total risk exposure scores, driven primarily by repetitive upper-body movements and sustained trunk flexion. With these roles identified as highest risk, efforts can be directed there as a starting point.

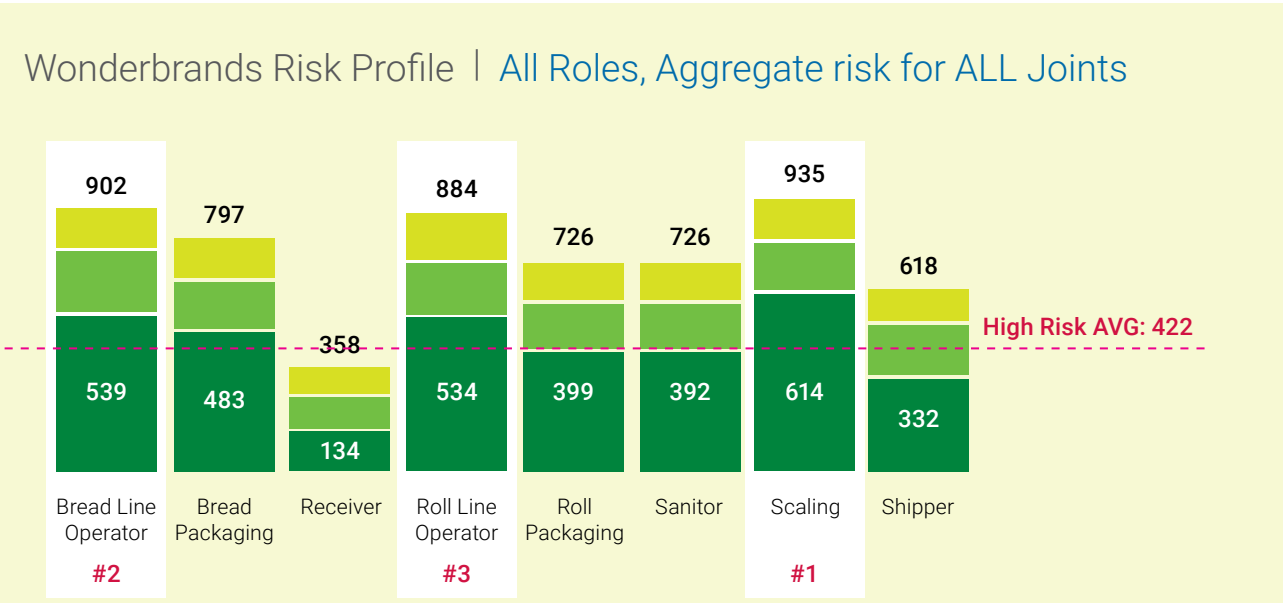


Figure 10. *Relative risk exposure by job type, identifying bread line operator, roll line operator and scaling roles as having the highest risk*

  - **Body region risk profiles:** The back and shoulders were identified as the top contributors to overall risk, particularly in manual handling and packaging activities.
  - **Shift-based differences:** Early data suggested higher exposure during day and afternoon shifts for certain roles (e.g., bread packaging and scaling), potentially linked to production volume and task rotation patterns.

- **Development of local technical capability:** LifeBooster's training and ongoing coaching, along with the train-the-trainer approach, increased internal expertise among site leads in digital risk assessment methods and data interpretation and improved in house ergonomic assessment capability.
- **Dissemination of findings to health and safety leadership:** LifeBooster presented the project's insights to site leadership at the Wonderbrands Langley facility, and the findings remain available to guide future potential ergonomic learning team sessions and targeted control implementation.

The project revealed several key lessons for future ergonomics efforts. The use of wearable sensor technology proved highly valuable, enabling efficient, representative and scalable ergonomic assessments far beyond what traditional methods can provide. The resulting comprehensive baseline dataset remains a lasting resource that leaders can leverage when ready. Because the sensors captured how work is performed under real production conditions, the findings aligned closely with Wonderbrands HOP principles. Pairing these data driven insights with structured learning team discussions can further deepen understanding of real work practices and strengthen shared ownership of safety outcomes. Although ergonomic learning teams were not created during the grant cycle, the groundwork for them was established, including session design, facilitation guidelines and proposed discussion structure, positioning the site to move forward when conditions allow.

Health and Safety team turnover created gaps in ownership, slowed momentum and demonstrated that relying on a single team limits visibility and continuity. The project underscored that initiatives of this scope require cross functional engagement beyond health and safety teams and should embed stakeholders from operations, HR, finance, and other departments to strengthen ownership, resource availability and long term sustainability. For scaling, involving multiple teams at every stage (planning, execution and review) helps safeguard against turnover, creates organizational champions and positions ergonomic initiatives as enterprise efforts rather than department led projects.

Key Takeaways

The 2024-2025 pilot projects provided organizations with the opportunity to integrate emerging technologies into real world environments and evaluate their effectiveness in reducing upper-extremity MSD risks. Although projects differed in scope, technology type and operational context, several shared lessons and themes emerged across the pilots.

Across all projects, it was clear that technology enhances but does not replace collaboration or critical thinking. Sensor data, risk scores and analytics dashboards were viewed as decision support tools rather than stand-alone solutions. **Participatory ergonomics** – actively involving frontline employees, operators and supervisors throughout the process – proved essential. Organizations found success when objective, technology-generated insights were paired with workers' firsthand knowledge of how tasks are performed. This kind of collaborative approach strengthens solution development, allows for validation of ideas and controls, and increases workforce buy-in.

A major benefit reported across pilots was the ability of technologies, whether motion analytics platforms, vibration monitoring wearables or multi-sensor systems, to visually communicate risk. Tools that showed risk trends, posture deviations or vibration spikes in real time helped employees and supervisors better understand exposure drivers and supported more meaningful collaboration during coaching sessions. Organizations noted that this visibility accelerated learning, improved technique and strengthened internal communication around ergonomics.

Across pilot sites using wearable or computer vision systems, teams emphasized the importance of collecting representative baseline data before implementing interventions. Comprehensive baselines enabled clearer prioritization of risks, improved targeting of controls and provided confidence in assessing the impact of changes over time. Organizations that captured large, diverse datasets spanning shifts, worker sizes and job groups reported improved clarity in identifying true exposure drivers.

Several sites highlighted the value of building internal ergonomic capacity. Empowering site leads to independently collect data, interpret results and coach teams improved sustainability and allowed organizations to maintain progress despite staff turnover. This approach also supports long term adoption by embedding ergonomic skills within operations rather than relying solely on external expertise.

Finally, pilot organizations reiterated that successful technology implementation requires clear program management, leadership support, worker acceptance and engagement, and readiness for adoption. Sites that aligned technology use with specific goals, ensured communication across departments and remained flexible when encountering operational challenges were best able to generate meaningful and lasting improvements.

Together, these takeaways demonstrate that pairing objective data with worker experience, fostering collaboration and strengthening internal capability are critical to maximizing the impact of technology for MSD prevention.

Conclusion

The 2024-2025 pilot grant program provided four MSD Pledge member organizations with the opportunity to partner with leading technology providers to apply emerging ergonomic solutions in real operational environments. Overall, organizations that piloted solutions reported that technology meaningfully enhanced their MSD prevention efforts, particularly by providing clearer visibility into risk patterns and enabling more targeted discussions with the workforce. The most successful outcomes occurred when organizations paired these objective insights with participatory ergonomics practices and invested in building internal capability through training and knowledge transfer.

Looking ahead, organizations are likely to benefit the most from piloting innovative **ergonomic technologies** if they:

- **Select technologies** that align with their specific tasks, exposures and operational needs, ensuring that tools directly support the risks they aim to address
- Ensure their organizations are **ready to implement new technology**
- Secure leadership support to signal organizational commitment and encourage buy-in across teams
- Develop a clear implementation plan, including designating and training the right people to serve as internal champions who can support adoption, troubleshoot challenges and sustain progress of technology implementation
- Take a **participatory ergonomics** approach and **engage frontline workers** early and often by incorporating their feedback into technology selection, piloting and refinement
- Start with a focused pilot in a controlled setting before scaling, allowing the organization to learn and adapt without overextending resources
- Establish clear metrics for success before piloting begins so outcomes can be evaluated objectively and consistently
- Build in structured feedback loops so that worker experience and operational data continuously inform adjustments throughout implementation

Additional information about the grant programs can be found **here**.

Authors

Marley Reynoso, MPH
Ram Maikala, Ph.D., ASP, FHFES
Paige DeBaylo, Ph.D.

Funding

This research was supported by Amazon.com Inc. Its contents and results reflect the authors' contributions and are solely their responsibility and do not necessarily represent the views of Amazon or the official position of the National Safety Council.

Feedback

Thank you for accessing this resource from the National Safety Council. Your interest in our materials exemplifies your dedication to workplace safety. We'd greatly appreciate your feedback so we can improve our offerings to make them most useful for you. Please take this **brief survey** to provide your feedback.