National Safety Council

Case Study

MSD Solutions Lab
an nsc program

Wearable Sensor Technology, Data Analytics and Ergonomic Learning Teams to Identify and Mitigate Ergonomic Risks in Beverage Manufacturing

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

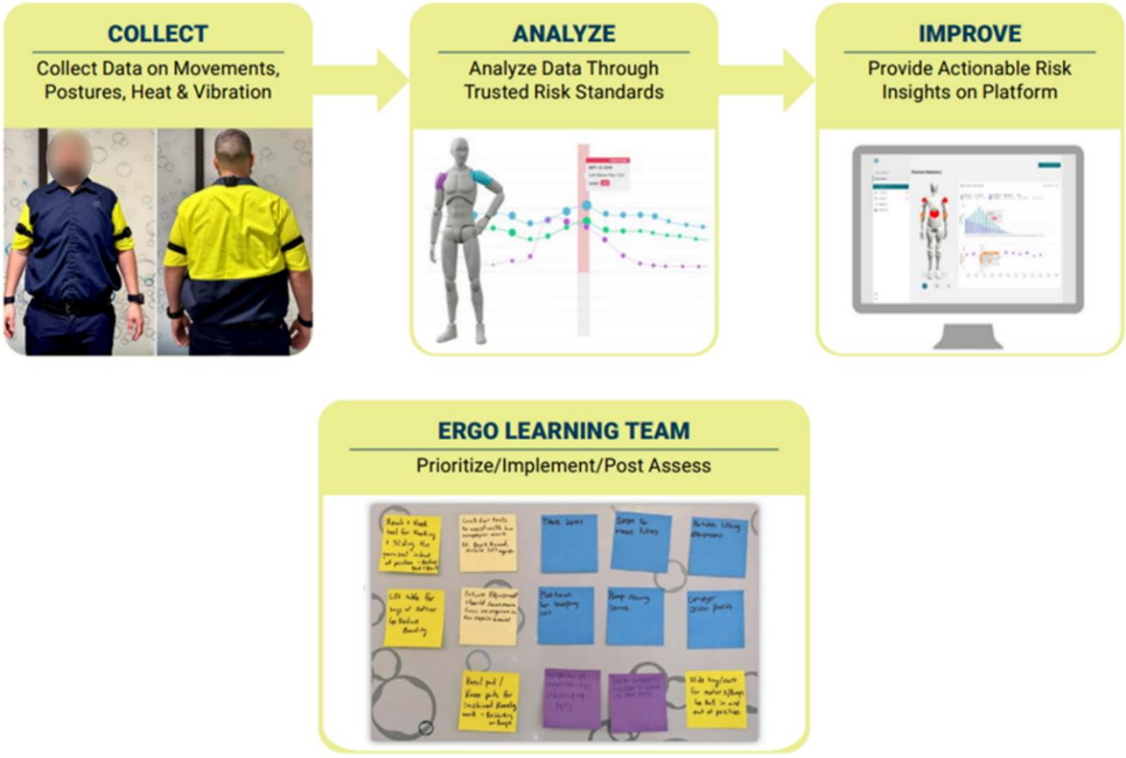
PGCS Arlington partnered with LifeBooster to utilize its wearable sensors and data analytics platform. The specific goals were to:

- 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 1. 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.

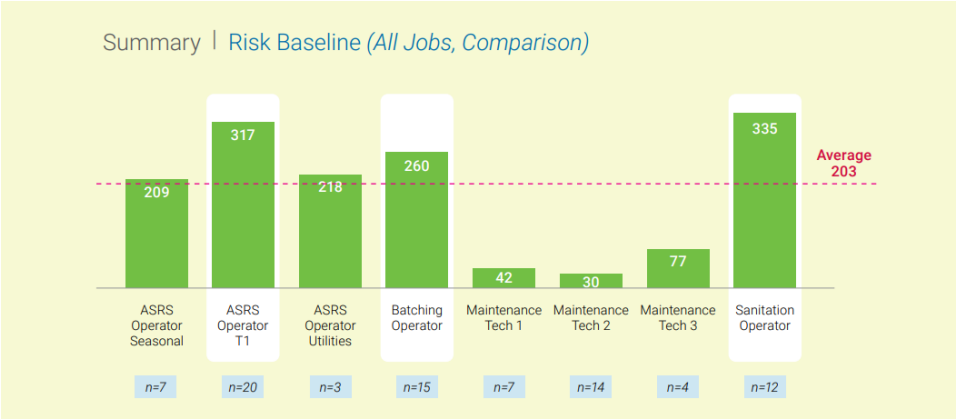


Figure 2. Relative risk exposure by job type: Sanitation, Salts ASRS and Batching operators had higher risk exposure scores (209-335) compared to the average (203), while maintenance roles had lower-than-average risk scores (30-77)

    - 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:** 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.

PepsiCo Global Concentrate Solutions is a division of PepsiCo that produces beverage concentrates and ingredients used to manufacture many of the company's beverage brands around the world. Operating within a global supply network, the organization focuses on delivering high-quality products while maintaining strong standards for safety, quality, and operational excellence.

LifeBooster is a workplace safety technology company focused on helping organizations prevent injuries through wearable sensor technology and advanced risk analytics. Its platform combines multiple wearable sensors with data-driven software to assess ergonomic risks, heat stress, and hand-arm vibration exposures across a wide range of work environments. By providing scalable, objective risk assessments and easy-to-understand risk scores, LifeBooster enables organizations to proactively identify hazards, prioritize interventions, and implement effective injury prevention strategies across their operations.