ERGO CUP® COMPETITION

The internationally recognized **Ergo Cup**® competition, sponsored by the Ergonomics Center of North Carolina and Edward P. Fitts Department of Industrial and Systems Engineering at North Carolina State University and presented by IISE, provides an exciting opportunity for companies to highlight their successful ergonomic solutions. The general theme across all **Ergo Cup**® categories is innovation.

Five Ergo Cup® awards are presented annually for outstanding solutions through training, engineering and teamwork.

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Team-driven workplace solutions

Two Ergo Cups will be offered in this category: one for organizations who conduct internal Ergo Cup competitions and another for those who do not. The criteria for the Team-driven Workplace Solutions are the same for both groups. Those organizations who submit an entry to the internal competition category will be asked to identify their project on the submission form.

Engineering/ergonomist-driven workplace solutions

Two Ergo Cups will be offered in this category: one for organizations who conduct internal Ergo Cup competitions and another for those who do not. The criteria for the Engineering/Ergonomist-Driven Workplace Solutions are the same for both groups.

Ergonomics program improvement initiatives

Must be a planned ergonomic program improvement initiative, process or management system designed to improve the effectiveness of a location's overall comprehensive ergonomics program. Examples include, but are not limited to: ergonomic training programs, incorporation of ergonomics into change management systems, ergonomics risk assessment processes, ergonomic prioritization systems, return-to-work programs, office ergonomic programs and ergonomic programs designed for mobile and/or telecommuter employees.

The 2017 Ergo Cup® teams are listed below – sorted by category.

Booth #: **318**
Category: ***Ergonomics Program Improvement Initiatives***
Title of Entry: ***2 Minute Ergo***
Location: **All corporate wide Gulfstream sites (3 countries, 11 sites) utilized this idea. Savannah, GA**

Presentation Description: In 2015, Gulfstream's ergo,program radically changed their approach to training. We implemented a new way to train called "2 Minute Ergo" a concept that focuses on results-focused style training. The idea has been utilized at all Gulfstream sites and is becoming the company benchmark on how to reinvent how we teach people.

Problem: Traditional training has always followed 3 main principles: 1) training should be in depth and taught by ergonomists/consultants/experts, 2) to increase understanding, classes should last from a few hours to a couple of days, and 3) push as many employees through training as possible. The belief has been that expert driven, in depth training will create culture change and lead to company wide ergo results.

Solution: Gulfstream's theory was to use the complete opposite approach. Our hypothesis was: 1) make training exceptionally short, focusing only on one principle at a time, 2) provide training at the point of use versus a classroom, and 3) make it a pull system so people access training when they want it. We believed our unique approach would lead to increased memory retention, employee driven ideas and solutions would increase and the end-user could actually become the teacher and be as effective, if not more so, as the expert ergonomist. We launched a corporate wide campaign called "2 Minute Ergo" that promised all ergo training (videos, paper, and in-person) be delivered in under 2 minutes.

Measureable Outcomes: The results: the corporate ergo department is no longer burdened with time consuming classroom training, 2) through the use of short videos and simple lessons, employees can train themselves and others on ergo and 3) in 2016 alone, over $1,000,000 was saved in labor hours/quality improvements/product damage alone (doesn't include injury cost avoidance) as a direct result of this simple yet highly effective training. But that's not the best part. In the spirit of helping all workers across the world, GAC has put all our training videos on YouTube for public use in hopes that all companies can benefit from our "2 Minute Ergo" idea.

Booth #: **418**
Category: ***Ergonomics Program Improvement Initiatives***
Title of Entry: ***Tournament Style Ergo Competition for Employee Involvement***
Location: **The Boeing Company - Fabrication Division Auburn, WA**

Presentation Description: Ergonomists have a difficult time getting fabrication/production shops involved with ergonomics projects. To get mechanics involved in the identification and mitigation of ergonomics risks, we created a site wide bracket style competition to help

Ergonomists get employees and support groups involved with Ergonomics projects and initiatives. The teams were given one year to create the solutions and compete against each other in a fun and competitive bracket style competition. The entire site competition allows all employees on 3 shifts to come out, see the projects, and vote for different solutions. Leaders and managers support the event by allowing everyone to participate during their shift.

Problem: Ergonomists have a difficult time getting fabrication/production shops involved with ergonomics projects. Employees are driven by production causing them to work faster and outside their safe zone, leading to increased fatigue and decreased morale. With high production rates and demands, ergonomics can take a back shelf which can lead to higher risks of injury.

Solution: By creating a bracket style competition of ergonomics projects, teams were motivated and empowered to mitigate ergonomics risks in their area. The competition was a proactive, innovative method to get mechanics, engineers and support groups involved in ergonomics fixes for their area. Teams were allocated work time to spend on the projects, and leadership supported engineering and tooling time allocated to these projects.

Measureable Outcomes: A total of 13 high risk projects were mitigated across The Boeing Fabrication site within a one year course.

Booth #: **320**
Category: ***Ergonomics Program Improvement Initiatives***
Title of Entry: **Change Point Safety Protocol**
Location: **Honda of Canada Mfg.**
Alliston, Canada

Presentation Description: Presentation Description: (Please include a 50-100 word description) Approximately 51% of all injuries at HCM are linked to recent process changes or New Model(NM) change points during worker engagement. HCM sustained an ergonomic injury reduction of 28% during new model timing(over 6 month period). A NEW Change Point Protocol system was created to address the risk for injury in all training aspects of change point tasks in current model and new model build events. 2875 Pro-Active Check (PAC) items were prioritized and tracked for completion. 364 (12.6%) of those concern items were immediately resolved (immediate - <2hrs). ROI = 7.73. Activity generated 91% positive feedback in participation.

Problem: Musculoskeletal disorders(MSD's) are the most common type of injury to occur at Honda of Canada Mfg (HCM). 51% of ergo injuries are directly related to "Change-Points" within current assembly processes and from New Model(NM) activities. In the past, workers were not aware with NM risk for injury until they were building the vehicles. Training focused on "what and how to do it" with respect to quality but little, if any, on injury prevention; Training method lacked controls to incorporate risk identification into the new process. A comprehensive Job Task Analysis (JTA) was typically performed after NM training. This NM cycle (4-5yrs) historically

causes a large Reportable Injury Rate(RIR) spike. After NM launch, injury prevention activities are slow to process due to the increased volume of activities in all aspects of the business (safety, quality, delivery, cost, and morale).

Solution: We developed a NEW Change-Point Safety Protocol to reduce the impact of "new" changes that affect RIR during NM timing. During training, we review the Job Task Analysis (JTA) with the trainee. We gather feedback of the risk and controls for that process. We adjust Process/ equipment/ tools to create a safer process for the trainee based on his/her feedback. JTA updates include the new information, any changes made are then included in overall training. As well, we implemented Pro-Active Checks (PAC) performed by production workers. These workers (who received specific ergo guideline training) gather worker feedback on all of their tasks to document and address any concerns they may have regarding their "new" process changes. They also act to address simple issues that generate process concerns and coach associates on preferred ergonomic solutions to any issues they observe. They effectively eliminate most risks/issues not identified during training and enforce controls during JTA review. All remaining concerns are assessed for priority and assigned for quick and effective resolution.

Measureable Outcomes: Safety: HCM sustained an ergonomic injury reduction of 28% when addressing any new change points at our assembly processes. Our New Change Point Safety Protocol system exists presently in daily training practice.

Quality: The developed system gathers safety concerns proactively along with potential quality concerns. 2875 pro-active check (PAC) items were generated and quickly investigated, prioritized and tracked to completion.

Delivery: 364 (12.6%) of the 2875 PAC investigation items were immediately resolved (immediate - <2hrs). All these items had direct delivery efficiency impact.
Cost: Input: Workers involvement + training = $98,700; Output: $862,400 in injury cost avoidance. ROI = 7.73

Morale: 91% positive feedback in participation. 5671(91%) of the 6232 gathered PAC feedback items pertained to making a positive improvement. As well, 2672(93%) of the 2875 investigations were closed by the supervisor/associate raising the concern.

Booth #: **321**
Category: ***Ergonomics Program Improvement Initiatives***
Title of Entry: **Ergo'n the Distance: Employees Leading the Way**
Location: **ATI Specialty Alloys and Components**
Huntsville, AL

Presentation Description: **T**he ergonomics team at ATI found itself lost with a growing backlog of Ergonomics problems they struggled to resolve. By taking steps to establish an employee and culture driven program, the team was able to reduce its project backlog, reduce injury rates,

decrease its response time to emerging ergonomics issue and engage the plant's workforce. Due to the team's proven success, it now serves as a model for other employee driven teams at the facility as well as other ergonomics teams at other sites. The team has received company wide recognition and competed in the 2015 Ergo Cup.

Problem: The Ergonomics program at ATI operated for several years as an expert driven program. As the core Ergonomics team attempted to transition to an employee driven program, it found itself challenged with problems that were perceived to be unsolvable with a growing project backlog. In the beginning of 2012 the team found itself faced with a project backlog of 12 jobs requiring attention, some dating back to 2009, and no tangible ideas or effective problem solving process to address those problems. Up to this point, most of the solutions the team had developed to address Ergonomics problems were either high cost capital projects requiring corporate approval or administrative controls which resulted in reoccurring problems. Due to the project backlog, it took the team several months to respond to emerging issues and risk mitigation efforts often carried over for multiple years. The workforce at the plant had virtually no awareness of Ergonomics and employees expressed very little interest in improving their work environments. Ergonomics related injury rates were also generally high, with up to 12 Ergonomics related injuries per year (1 injury per 12 employees). An Ergonomics program Audit performed at this point revealed an audit score of 1.3/4, classifying the program as being "poor".

Solution: The leadership at ATI realized that an employee and culture driven approach was necessary in order to move the program forward. Outside mentoring was sought in order to reduce the project backlog, reduce the frequency of ergonomics related injuries, and build a self-sufficient culture driven program within five years. To set the foundation for the program the team:

- Defined roles and responsibilities for team members.
- Initiated annual program audits that allowed the team to identify its deficiencies and to develop both tactical and strategic plans leading to tangible program results.
- Developed documented processes for both problem solving and project completion in order to provide structure to the team's problem solving efforts.
- Initiated reviews of weekly near hit, first aid, and injury data in order to promptly respond to incidents and in order to identify trends.
- Identified projects with easily solvable problems and developed solutions for those problems inn order to generate momentum.

As the team gained momentum by eliminating risks and closing out projects, the focus then shifted to building a plant wide Ergonomics culture. In order to work towards establishing an Ergonomics culture, the team:

- Established and trained a sub-committee comprised of employees outside of the core team to serve as the eyes and ears for the team.
- Delivered training on the fundamentals of ergonomics to all employees in the facility in order to increase awareness.

- Delivered quarterly work methods training sessions to each shift, which took place in the form of scripted 10-minute interactive tool-box talks.
- Pioneered the plant's annual Health Fair in order to share its initiatives and progress with the rest of the work force, which has grown significantly and now includes representation from other health and safety related teams at the facility as well as outside vendors.
- Employed creative strategies for soliciting input from other employees and spreading awareness, such as utilizing oversized discomfort survey posters, by allowing employees to place a colored thumbtack corresponding with their department on the body part where they feel the most fatigue after their work shift,
- Improved the team's proficiency in Ergonomics and adopted more advanced tools and technology in order to perform assessments and solve problems.

Measureable Outcomes: The team's accomplishments since employing this employee and culture driven approach are as follows:

1. Project backlog has been reduced from an increasing backlog of twelve projects to a declining backlog of only four projects (three of which have been added in the last month).
2. The number of Ergonomics related injuries per year has been reduced by 92% from three years ago with only 1 ergonomics related injury in 2015 (1 per 150 employees), down from 12 in 2012 (1 per 12 employees).
3. The number of Ergonomics related early reports per year through near hit and at risk observation reports has increased by 67% from three years ago.
4. Audits on the Ergonomics program show an improvement in the program audit score from 1.3/4 in 2012 (classifying the program as being on the borderline between "bomb" and "poor") to 3.1/4 (classifying the program as being "good" on the way to "excellent") with a few categories such as Ergonomics Assessments and Program Organization and Management approaching a perfect 4/4.
5. 15% of the plant's workforce is represented on either the Ergonomics core team or the Ergonomics sub-committee.
6. The response time for responding to emerging issues has been reduced from several months to only a few days.
7. The Ergonomics team has served as the model for 5 other employee driven teams in the facility, as a steering committee has been formed with several employee driven teams all modeled after the Ergonomics team in an effort to reach VPP status.
8. This team has served as the model for the formation of other Ergonomics teams throughout the company and has received visits and praise from the company's top leadership.
9. In 2015, the team competed in its first Applied Ergonomics Conference Ergo Cup, competing in the "Team-Driven Workplace Solutions" category.

Booth #: **324**
Category: **Ergonomics Program Improvement Initiatives**
Title of Entry: **3D Printing…. Bringing Ergonomic Solutions to Life!**
Location: **Nexteer Automotive Australia Melbourne, Australia**

Presentation Description: Nexteer Australia established a multi-faceted 3D printing initiative within our team, which facilitates the development and implementation of ergonomic solutions in a workplace. We have successfully implemented a number of solutions at low cost and with minimal lead time. Any team member can develop an idea, design it and print it.

The most recent innovation called PODs, has improved the ergonomics involved in the daily assembly of 580 aftermarket kits by reducing the work floor space required, minimizing decanting/replenishment of components and removing the need for overstretching, twisting and constant head checks by operators.

Problem: Nexteer Australia is a small organization without the resources to fabricate our ideas and outsourcing is costly with long lead times. This 3D printing initiative allows us to implement ideas inexpensively with short lead time. It also allows us to experiment with solutions.

With the above PODs example, operators were overstretching and twisting to reach for parts and constant head checks were required to locate the correct parts. The number of different saleable kits supplied to the customer makes customization of the operation a big challenge.

Solution: 3D printing technology is becoming more economically viable, and has provided Nexteer Automotive Australia the opportunity to implement this initiative to improve safety and ergonomics within our manufacturing facility.

The example of the PODs involved the design and manufacture of 4 x 3D-printed, connecting brackets. The brackets permit attachment/interlocking of standard plastic storage bins to PVC pipes, creating vertical storage hoppers. This has reduced ergonomic risk by 25% (RULA analysis), improved cycle time by 30% and reduced floor space by 25%.

The following are some other recent examples:

- 3D printed hand tools such as the air test seal tool which eliminates the use of the hand as a fixture and facilitates the use of a power tool to reduce risk and improve efficiency.
- 3D printed tool nest to hold valves, enabling operators to have both hands free when performing the task of tapping out valves.
- 3D printed mounting bracket installed, which eliminates the need for operators to leave their work-station to perform the task of the pinion nut installation.
- Ergonomic improvement done on seal dispenser

Measureable Outcomes: This 3D printing initiative for improving ergonomics, has so far, resulted in reduced ergonomic risks, improved cycle time and reduced floor space, in addition to

huge cost savings and minimal lead times when compared with the alternative of utilizing the services of an outside company to design and fabricate solutions.

Booth #: **326**
Category: **Ergonomics Program Improvement Initiatives**
Title of Entry: **Healthy "PIES" Fuel Lives**
Location: **Johnson & Johnson ETHICON**
Cornelia, GA

Presentation Description: To help employees expand their energy and perform their personal best at home, work and play, we have developed a holistic approach to employee health & wellbeing. We focused on the whole person to minimize the impact of ergonomic related injuries. Our approach has focused on Prevention, Intervention, Engagement and Solutions, which we have termed "PIES".

We believe that Healthy "PIES" Fuel Lives.

Problem: The project was prompted based on a high ergonomic occupational incident rate from 2009-2013 (based on OSHA 300 logs) which represented 35% of lost work days. It was realized that life factors at work, home and play contributed to the overall risk for ergonomic related injuries.
Solution: To address the risks at work, home and play we implemented "PIES"

PREVENTION: Ergonomic assessments were performed throughout the plant to identify high and moderate ergonomic risk job tasks. The high and moderate risk job tasks were then evaluated based on employee physical demands. Changes were implemented and stretching programs were designed based on these evaluations to decrease the potential of ergonomic related injury/illnesses.

INTERVENTION: Early symptom intervention is a service emphasizing early detection of discomfort and physical strain for work related and non work related issues. Ergonomic tactics are personalized to each employee and focus on job coaching and 1st aid. These tactics include, on site physical therapy, stretching, coaching and Awareness

ENGAGEMENT: A robust safety concern reporting system (Good Saves) and improvement suggestion system (Plant Betterment) empowers employees to voice their ergonomic concerns and provide ideas for ergonomic improvements. Systematic reviews are completed for all suggestions with implementation of solutions and feedback to the employees.

SOLUTIONS: Our focus addresses equipment challenges and behavioral aspects of ergonomics. Equipment solutions include lift assist devices, adjustable work stations for production and office, production equipment ergonomic upgrades. Behavioral aspects include ergonomic

stretching program, job coaching, on-site physical therapy services, fitness center, and early symptom intervention.

Measureable Outcomes: 2015 year end results showed zero lost time ergonomic injuries and illnesses which represents a 100% reduction. This performance level has been sustained through 2016.

Through Prevention, Intervention, Engagement and Solutions (PIES)… focusing on the whole person minimizes the impact of ergonomic related injuries.

We believe that Healthy "PIES" Fuel Lives.

Booth #: **319**
Category: **Ergonomics Program Improvement Initiatives**
Title of Entry: **Ergo Event Stations**
Location: **GE Transportation Systems**
Erie, PA

Presentation Description: Accident investigation results and injury data were pointing to lack of employee awareness and engagement as the main driver for an increase in the ergonomics injuries at Building 5 in GE Transportation at Erie. The ergo team looked for different options to promote ergonomic awareness and engagement among the employees which is a key factor to reduce the injuries beyond work place changes. By providing hands-on-demonstration and training on correct body postures and work methods we thought of increasing the employee awareness. With morale being at an all-time low due to organizational changes and our injury rate increasing, we wanted to get everyone thinking about safety and ergonomics again. Through brain storming and employee inputs, we came up with the new concept of ergonomic event stations. The ergonomic event stations targeted specific body related ergonomic injuries that were common in our work area. We went over fact sheets on ways to prevent ergo related injuries for each area. We also had interactive events for each body type to demonstrate the ergo best practices. We ended by giving the employees a quiz sheet with a feedback section on ways for us to improve the stations.

Problem: The number of injuries in building 5 of the Erie GE transportation site had been steadily climbing over the past 3 years. After reviewing the record of our injuries from 2013-present, we found that 88 injuries were ergonomic related. We wanted to find a way to reduce the number of those ergonomic related injuries. To do that, we further examined our ergonomic injury data to find the underlying cause of the injuries. The data indicated that 35% of the injuries were caused from poor body position and awkward postures - 28% were from lifting, lowering, carrying, pushing and pulling, 26% of the injuries were caused from forceful exertion of arms, hands, wrists and fingers. 10% of the injuries were from repetition. We determined the areas we wanted to focus on based on those causes. A deep dive on the data pointed that 23% were back, 17% were shoulder and 10% were elbow injuries. Once we narrowed down the

injuries by causes and body types, we had several brainstorming meetings to develop an effective solution to reduce those injuries.

Solution: After several meetings with our ergo team and feedback from the hourly employees, we found that our building was lacking in ergonomics awareness. Our ergonomics team, which consisted of hourly and salary employees ranging from safety coordinators, quality inspectors, shop floor supervisors and the plant manager for building 5, came up with ergonomic event stations as our solution. We knew that our focus was going to be employee awareness. We thought, what better way to do that than to have our hourly and management employees do an interactive ergo session demonstrating some of our best practices. Our goal was to make employees aware of the different types of possible ergo injuries and prevention methods. We developed nine stations focusing on the areas where we had the most ergo injuries.

We split our ergo team up into groups and each of us had a fact sheet as well as an event to design. We met periodically to review our ideas and fact sheets. Once we finalized our fact sheets and ideas that we all agreed on, we began building the stations. We designed the stations to be interactive and informative. We also kept in mind our limited time frame and budget to do the events. We developed the stations so that they were relatively quick and easy. We used recycled boxes, paper, markers, unused weld leads, borrowed tools, gloves from the tool crib, a Wii console from our wellness center, scrap sheet metal, a borrowed force meter and cart, and other miscellaneous recycled material to create our stations. The stations took about two months to develop . Our ergonomics team went through the event stations first to determine the time needed to complete them and the ease of use. Once that was successful, we spent four weeks sending all of our employees through the stations. Each session took about an hour and the employees spent the last 5 minutes filling out a quiz. We used a rating scale to measure the impact of the ergo event stations and feedback to make any modifications as necessary.

Measureable Outcomes: Several employees received high scores on the quizzes and left positive feedback on the ergo event stations. Quite a few employees found the event stations to be informative and started to utilize the best practices in their every day job. To quantify our results, we calculated the annual operational savings, injury prevention savings, cost of solution, simple ROI and the payback period.

A: Annual Operational Savings = 0

I: Injury Prevention Savings = $85,428 (Avg Cost of Shoulder or Back Injury X 6 Injuries)

Cost of Solution = $ 200

Simple ROI = (A + I) / C = 427.1

Simple Payback Period (Years) = C / (A + I) = .002 Years

Booth #: 420

Category: **Ergonomics Program Improvement Initiatives**
Title of Entry: **Behavior Based Ergonomics**
Location: **The Estee Lauder companies New York, Pennsylvania, Canada, Belgium, Germany, United Kingdom, Switzerland manufacturing and distribution sites.**

Presentation Description: Leveraging the employee-driven Global Behavioral Based Safety (BBS)program, the Estee Lauder Companies' has been able to improve and strengthen ergonomics efforts within our Global Supply Chain, (manufacturing and distribution facilities). Advanced ergonomics training was presented to site BBS Teams assisting them in identifying ergonomics risk factor exposures and unsafe behaviors. Teaming with the company's external CPE partner, the BBS Teams developed a detailed ergonomics-focused behavior observation checklist. Applying learned skills and comprehensive data analysis, the BBS Teams intiaited100+ ergonomics improvement projects throughout the Global Supply Chain. These projects are shared and their successes celebrated at our annual Global BBS Workshop.

Problem: Many employees, although enthusiastic and interested in solving issues at their sites, lacked the tools (awareness, knowledge, time) to be effective participants in the ergonomics process. As a result, employee engagement in ergonomics efforts was limited at many sites. This was due, in large part, to the lack of an established and clear link between the Company's Global ergonomics Program and Behavioral Based Safety ergonomic risk reduction efforts.

Solution: The ergonomics-focused activities and training provided to the Global BBS Teams has empowered employees and increased their awareness of ergonomics risk factors throughout the Company. employees now have a 'boots on the ground" approach in resolving identified ergonomic concerns at their sites and have become a true energized driving force in the program. Communication lines have been improved with global sharing of best practices and ongoing ergonomic improvement efforts. Analysis of the data collected by site BBS Teams helps to identify and prioritize focus areas for the CPE, Global Ergonomics Program and safety personnel for the next fiscal year.

Measureable Outcomes: A key driver in reducing ergonomics recordable injuries by 33% last fiscal year throughout the supply chain! 250+ employees within 32 BBS Teams have received Advanced Ergonomics Training. Each site's BBS Team developed their own ergonomics focused observation checklist. These checklists provided in-depth at-risk data at the site level that was then graphed and trended at both the local and global levels. 100+ employee-led ergonomic projects were implemented last fiscal year improving safety, reducing cost and improving quality efficiency.

Booth #: **104**

Category: **Workplace Solutions I (Team-Driven Workplace Solutions with internal competitions)**
Title of Entry: **Cart Wheels and Handles**
Location: **Volkswagen Group of America**
Chattanooga, TN

Presentation Description: The idea to improve the manual transfer of car bodies came from a team member who interacted daily with the carts and understood the ergonomic and safety issues with the process. Carts that carry metal car bodies were modified by Volkswagen team members by restructuring wheel placement to reduce push/pull and turning force. In addition, a removable handle was developed to attach to each cart and eliminate the need to bend over to push the cart and provide a safe place for hand position to eliminate pinch-points. The restructured carts and handles also improved quality by reducing defects caused by pushing on the car body and improved productivity by reducing the amount of time needed to move the carts.

Problem: Metal car bodies are manually pushed (4 times per day) from the production line to the measurement room on four wheel carts. These carts present ergonomic and safety concerns for the team members while pushing the carts. The carts have fixed wheels on one end and swivel wheels on the other. This wheel design created push forces of 22 kgf and turn forces of 39 kgf. The cart design is low to the ground requiring team members to bend over and place their hands on the cart near pinch-points. There have been numerous discomfort complaints and injuries attributed to moving these carts.

Solution: A team member's idea to change the wheel layout and provide a handle to improve the movement of the carts was conceptualized, designed and trialed. The new wheel layout reduces the initial and sustained push forces and greatly reduces turning force of the carts. With the addition of a handle, that can be moved from cart to cart, the ergonomic burden of bending over to push the carts has been eliminated and the handle provides safe hand placement to protect from pinch-points. The reduction in maneuvering effort has improved ergonomics, reduced delivery times and reduced defects. But, most importantly, morale of the team members was boosted when this ergonomic burden was reduced.

Measureable Outcomes: This ergonomic improvement idea led to multiple instances of safety, quality, delivery and cost improvements. Volkswagen team members were able to re-use the wheels, bolts and mounting plates to modify the wheel layout of the carts resulting in ZERO cost to modify the carts (17 total). 8 handles were designed and built on-site at a cost of $75/handle ($600 total) and these handles can be used on all carts. Safety improvements, including pinch-point elimination and a 45% reduction in ergonomic score, resulted in a 100% reduction in injuries (7 to 0) resulting in a $3500 yearly savings. The reduced effort to push and maneuver the carts provided an 18% decrease in delivery time, thus saving $2088 yearly. The handle eliminated the need to push on the car body, thus reducing defects and re-work time, yielding a $1560 yearly savings in Quality. This fantastic improvement of 17 carts allowed for the cancellation of the order for 5 new carts ($8, 223 per cart). This cancellation saved the company

$40, 565. Total investment for this improvement idea is $600 and the total annual savings is $47,713 with an ROI of 3 production days. This improvement idea is now the benchmark for cart design and is being implemented in other areas of the facility.

Booth #: **106**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions with internal competitions)**
Title of Entry: **Custom Built Conveyor Slide Rail-Caster Moving and Positioning System**
Location: **Tyler Pipe and Coupling**
Marshfield, MO

Presentation Description: Tyler Pipe & Coupling manufactures couplings for cast iron soil pipe. Gaskets for the couplings are produced on injection molding machines. Takeaway conveyors weighing 475 pounds transfer the molded gaskets to an inspection station. The conveyors are manually moved into position 125 times a year. The team assembled to address the ergonomic risk associated with this task. Through simple incremental design improvements (casters, brakes, slide rails, magnets) a positioning system was created that reduced the for (90%) and the man power (50%) required for this task.

Problem: Our team members were exposed to a high risk of sustaining a permanent disability from a strain-sprain as well as the significant risk of a traumatic crushing injury when moving conveyors. Two to three people were needed to move the conveyors approximately 15 feet through a narrow confining area to store out of the way for machine maintenance and cleaning or up to 200 feet should the conveyor need repairs which are performed in the maintenance shop. Each conveyor weighs 475 pounds and requires 200 pounds of force to move. Sliding the conveyors across concrete floor sections and transitioning across gaps and uneven surfaces presented additional potential for ergonomic strains due to the stationary design of the conveyors. In addition to the ergonomic strains from moving the conveyor, a crushing hazard was present when the conveyor was removed from the machine because it would fall 8 to 10 inches to the floor due to the design of the injection mold machine. Lastly, team members were exposed to potential crush, pinch points to the hands, and strain injuries when lifting and maneuvering the conveyor to return it to the proper position under the injection mold machine.

Solution: In order to significantly reduce the ergonomic stressors and eliminate the potential for crushing injuries the team designed and built a prototype Slide Rail - Caster Moving and Positioning System for the conveyors. After a few iterations of the prototype, the team created a unique system utilizing swivel casters, a creative slide rail, and magnets that kept a pair of the swivel casters at the end of the conveyor to prevent it from falling when removing and placing the conveyor back under the molding machine. While the initial design achieved the mobility we were looking for and the elimination of the conveyor falling when removing it, the team discovered that the conveyor moved too easily when it needed to be stationary for the operators running the injection mold machines. Locking brakes were then installed to keep it in place. In addition, the original magnets installed did not have enough magnetic power to keep

the casters and conveyors in place so special high powered magnets were installed that solved that issue. Breaking the hold the magnets have on the injection mold machine is simply done by pulling the conveyor at an angle to release it from the machine. The final design of the conveyor slide rail & caster moving system simplified the moving process allowing a single person to safely perform the task.

Measureable Outcomes: The custom built conveyor slide rail & caster moving and positioning system reduced the Rapid Entire Body Assessment (REBA) score from a 10 (high risk) to a 1 (negligible risk). With the reduction in physical force from 200 pounds down to 20 pounds required to move the conveyor it also reduced the manpower needed by 50 percent. One person is now able to move and position the conveyor safely. This will result in a labor cost savings of $1124.55 a year. Production can be increased by 216,000 gaskets a year- due to less down time. Total project cost is $3,186 dollars for all 9 conveyors of this type.

Figures provided by our insurance provider and MO Workman's Compensation, assuming a 20% permanent partial disability says cost avoidance for a related back injury resulting in a disk herniation is approximately $77,886.15 per occurrence. Potential shoulder injuries would cost $69,120.26 per occurrence. Potential Hand and foot injuries would cost between $42,345 and $48,174 per occurrence.

Team members are excited about the new custom built conveyor slide rail & caster moving and positioning system and as one of our team members stated, "It's fantastic, I don't hurt anymore and I don't feel like I'm going to injure myself or damage the conveyor from dragging it across the floor."

Booth #: **108**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions with internal competitions)**
Title of Entry: **Gravity Elevator Lift**
Location: **Toyota Motor Manufacturing, TX, Inc.**
San Antonio, TX

Presentation Description: Toyota Motor Manufacturing, TX, Inc. (TMMTX) is home to the Toyota Tundra and Toyota Tacoma. The deck and frame for each truck are built separately, and joined together. To assist with the marriage, deck jigs are used to aid in alignment. Once the marriage is complete the jigs are removed and placed in totes (four jigs per tote). As the totes become full they must be lifted and carried to a rack where they are collected by a conveyance group that pick up the totes and deliver them back to the assembly process that install them. The awkward waist-to-shoulder lift, weight of totes, and the high repetition were proactively identified as physical risk factors for WMSDS. Thus, production team members looked for ways to improve the process. Their solution was to create a counterweight "no-touch" flow rack to eliminate lifting of totes. The resulting solution not only improved ergonomic condition for the

production team members but also for the conveyance team members who deliver the totes to the production line.

Problem: The deck jigs assist in the deck/frame marriage. They are removed and collected into totes and delivered back to the production line where they are recycled through the system. Each tote weights 12.5 lbs. for a cumulative weight of 799 lbs. lifted per shift. Because of the configuration of the production area and height of the truck, team members must work on an elevated platform. Once the tote is full of deck jigs, the team member must lift each tote and take it to a rack that leads to lower level for the conveyance group to gather and remove. This results in excess material handling of deck jigs.

Solution: Production team members and the fabrication team closely studied how to reduce the lifting and awkward ergonomic postures that can lead to WMSDS. Working together they were able to design and create a "no touch" flow rack to eliminate 100% handling of the deck jig totes using the Karakuri Kaizen concept. Karakuri Kaizen is a materials handling devices that relies on gravity, levers, cams and inertia to move bins, transfer parts between machines, or delivers a controlled number of small parts to an operator's hand. The new flow rack uses weights and counterweights (non electrical power) in order to deliver the totes back to conveyance. This rack can self-send and self-return using the weights and counterweights of the totes and gravity. It eliminates any electrical or power components and takes the full bin totes from the production platform down the self contained elevator onto the flow rack and then retrieves an empty tote that travels back to production platform for next use. The implementation of the Karakuri Kaizen rack has eliminated all bending, stooping, twisting, squatting, and lifting for the production team members and has significantly improved the loading and unloading of the totes for the delivery Team Members as the rack height is approximately 42 inches from the floor, keeping the lifting of the totes at optimal lift zone.

Measureable Outcomes: Reduced cycle time 0.5 seconds with annual production savings of $3,878
Cost avoidance of 1 injury/year results in an annual savings of $25,000 (direct + indirect cost)
Cost of solution was $3,134 (cost of materials + labor)
ROI = 821%, with a payback period of 27 days

Over 451,000 lbs. lift eliminated for assembly Team Member per year.
902,204lbs lift eliminated for conveyance Team Member per year.

Booth #: 110

Category: **Workplace Solutions I (Team-Driven Workplace Solutions with internal competitions)**
Title of Entry: **Hanging Process Dolly**
Location: **Toyota Motor Manufacturing, MS Inc**
Blue Springs, MS

Presentation Description: Team members use stationary parts and tool stands on the Engine line in Assembly shop. Team members must turn around 9 times to pick up parts/tools. The process is rated yellow for moderate ergonomic risk at 26.63 burden points.

The team installed a hanging overhead gantry system for the process parts and tools which eliminated the need to turn around to get parts/tools. The improvement reduced the process takt-time by 8.3 seconds and reduced the ergo burden rating to 19.35 which is green for low ergonomic risk.
There was a total injury cost savings of $140,500 (96% reduction in injuries) and a time-cost savings of $16,205 ($0.80 per vehicle). Total cost savings was $156,705 in one calendar year.

Problem: Team members use stationary parts and tool stands on the Engine line in Assembly shop. Team members must turn around 9 times to pick up parts/tools. The process is rated yellow for moderate ergonomic risk at 26.63 burden points.

Solution: The team installed a hanging overhead gantry system for the process parts and tools which eliminated the need to turn around to get parts/tools. The improvement reduced the process takt-time by 8.3 seconds and reduced the ergo burden rating to 19.35 which is green for low ergonomic risk.

Measureable Outcomes: There was a total injury cost savings of $140,500 (96% reduction in injuries) and a time-cost savings of $16,205 ($0.80 per vehicle). Total cost savings was $156,705 in one calendar year.

Ergonomic burden score was reduced from 26.63 to 19.35 (27%).

Booth #: **112**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions with internal competitions)**
Title of Entry: **Karakuri Dunnage Return Assist**
Location: **Toyota Motor Manufacturing West Virginia (TMMWV)**
Buffalo, WV

Presentation Description: At Toyota's West Virginia Power Train Plant, Team Members are assembling a 6 cylinder engine at a cycle time of 54 seconds. This particular sub assembly process (Final kitting cell) involves installing two oil control valves and two cam angle sensors to the head cover and then transferring the head cover over to a second Team Member to install to

the engine. The dunnage boxes that house the head covers require the Team Member to push them down a flow rack to send back to the supplier. This job element requires the Team Member to bend their back at approximately 45 degree angle at a reach of 1000mm (hip to hand). The over-reach condition puts Team Members at a high risk for back and/or shoulder strains. The high risk postures were quickly identified before any injuries occurred due to the Team Members in the 6-cylinder Final line utilizing prevention systems already in place at TMMWV such as Discomfort Surveys, Safety Concerns and HYP (How's Your Process). A Team Member and Team Leader designed, fabricated and installed a Karakuri device. This newly designed Karakuri arm eliminated the awkward postures and potential injuries, reduced total work time and eliminated the potential for customer defects due to contamination.

Problem: Team Members running the kitting cell process identified the over-reach condition with the dunnage return as an ergonomic issue through TMMWV's standard discomfort survey process. Toyota North America Standard for a frequent reach is <700 mm. The identified condition was a 1000mm reach which created a no good back posture for approx. 2 seconds per part. The current volume for the process is 500 engines/shift. This equates to 500 No good reaches per shift. There is also a risk of being struck by the next full box of head covers coming down the flow rack when the Team Member reaches across the flow rack to push the empty dunnage box down the flow rack return chute.

Solution: A Production Team Member that runs the process designed, fabricated and installed a gravity assisted return device. This device is an assist arm that uses the weight of the full dunnage container to transfer energy to the empty dunnage container and push it down the return lane. Toyota refers to this as a karakuri device. The karakuri assist device eliminates the need for the Team Member to push the empty dunnage down the return lane. This simple improvement eliminates the deviated back posture and over-reach for the Team Members.

Measureable Outcomes:

1. Eliminated 45 degree back bend and 1000 mm over-reach (reach is now <500 mm and back posture is neutral).
2. Back injury prevention cost avoidance of $125,000 per injury
3. Reduced total work time by 1 second per part (528 seconds per shift)
4. Eliminated potential to introduce contamination onto sealing surface from leaning over full containers (potential customer defect).
5. ROI =.0015 year (<1 shift). Cost = $464.00, Cost avoidance savings = $317,021 per year. ROI = $464.00/($317,021/year) = .0015 year

Booth #: 114

Category: **Workplace Solutions I (Team-Driven Workplace Solutions with internal competitions)**
Title of Entry: **Step It Up**
Location: **Toyota Motor Manufacturing Indiana (TMMI), Princeton, IN**

Presentation Description: The Toyota Indiana West Assembly Plant builds the Highlanders and Sequoias. On the trim line, team members install the windshield rivets, accelerator pedal, and electronic control unit bracket. This process resulted in multiple early WMSD discomfort reports, as well as injuries due to extended vertical & horizontal reach, poor ergonomic postures, and push forces that were a high/medium risk. Because the vehicle is built on a moving line, a platform was not feasible and because of sequencing, moving this application to another area was also not an option. Production team members designed and fabricated a synchronized, telescoping cart internally. The cart is a simple and straight forward solution to reduce vertical and horizontal reach, as well as reducing the push force for team member all while improving quality, cost, and productivity.

Problem: Every 61 seconds 5 windshield rivets are installed into every Highlander and Sequoia, for a total of approximately 2300 rivets installed per shift. The rivet tool used by team members weighs 3 pounds. The team members are placed in an at risk posture performing overhead shots with rivet tool for 10 seconds per vehicle. Team members also were faced with over reaching horizontally to retrieve parts from cart. There were 8 early WMSDs reported. There was also three injuries (1 surgery) with 97 lost work days for team members, which also lead to staffing constraints. An ergo assessment showed this process was a medium/high risk process for shoulder burden, as well as, deviated wrist for extended time. In addition to the ergonomic process concerns, quality, productivity, and cost issues were present. Due to reach, angle and making a blind shot, team members periodically scratched the exterior of the vehicle, causing time and cost to repair. Time was also lost by team members having to take longer to position tool correctly with the shot not being made in line of sight.

Solution: Production team members formed a working group and studied how they could reduce the team member burden. Their first prototype designed was a cart with a step to help reduce some of the vertical and horizontal reach. They realized it was not accommodating for all team member heights. They also saw that team members had to reach for other hardware in the process to complete their work. After the team designed and fabricated the final prototype in house using mostly materials already available in plant. Their step cart was made of light weight carbon fiber and aluminum to reduce force burden to push the cart back to the beginning of the process. When team members step on the cart, it syncs to the line to move with the vehicle. Team member uses a foot control to activate air bag to lift them to preferred height needed to achieve a good ergonomic posture reducing vertical reach. This also places the team member in line of sight eliminating quality issues caused from not having a clear view also reducing time and cost for repairs. Productivity also improved with the time saved from cart syncing to the line and time spent walking and retrieving parts. A telescoping drawer was also added to the cart, reducing the horizontal reach to retrieve hardware needed for process.

Measureable Outcomes:

- Eliminated early WMSD discomfort cases and injuries (annual savings of $120,549)
  Reduced vertical reach (1931mm-1633mm) and horizontal reach (838mm-495mm)
  Cart Push force reduced from 6.5kg to 3.2kg
- Cart Weight reduced from 78lbs to 36lbs
- Overall process assessment score dropped from Medium-High risk to a low risk process
  Reduced cycle time by 4 seconds (annual savings of $10,348)
- Cost savings for scratch repairs (1 per week) (annual savings of $2,400)
  Quality improvement-rivet shot in line of sight and reduction of scratches caused by tool
- Based on total annual savings of $133,297, Return on Investment (ROI) is 1209%
  Payback period is 19 production days

Booth #: **116**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions with internal competitions)**
Title of Entry: **Gear Shift Knob Tightening**
Location: **Toyota Motor Manufacturing de Baja California, S. de R.L. de C.V. Tijuana, Mexico**

Presentation Description: At Toyota's Vehicle assembly plant in Baja California, Mexico, Tacoma pickups come out of the assembly line every 208 seconds.

During the final assembly of the trucks there is a console installation process that includes attaching the gear shift knob. During this process an ergonomic burden was detected during a routine team member to team member ergo and posture risk evaluation.

Team members observed that installing the gear shift knob involved twisting of the wrist a total of 18 times to fully tighten the gear shift knob on each vehicle. During further investigation the team members identified two previous incidents of wrist strain associated with this process. A problem solving team, including the supervisor, analyzed this concern using internal ergonomic guidelines. Several potential solutions were tested, including fabrication of prototype assist devices resulting in a final tool that could be attached to a torque gun in place of using the hand and 18 twists to install the gear shift knob. This tool helped eliminate the ergonomic risk.

Problem: Ergonomic: At the moment of manual installation of gear shift knob, team member turned wrist 18 times (standard ergonomic Toyota guideline max = 3), in 120 cycles in a working shift, times 6 days a week. Also hand ulnar deviation was 18 degrees (Toyota ergo standard max 15 degrees).
Productivity: 20 Seconds accumulated downtime / shift due to reworks from burrs and dirt transferred to gear knob by gloves when tightening.

Quality: Burs and dirt transferred by Team member's gloves caused gashes & scratches on gear shift knob. Total 200 scraped knobs/ year

Solution: Team members proposed and analyzed 3 potential solutions, making prototypes for each idea.
Objective was to eliminate no good wrist ergo burden.

Prototype one. Design of hand crank to install gear shift knob.
Outcome:

- Ergonomic: Wrist turned reduced from 18 to 8. Still out of Toyota ergo guidelines(max 3)
- Ergonomic: Wrist ulnar position was in the maximum limit = 15 degrees (max 15 degrees)
- Quality: Caused Scratches in gear shift knob

Prototype two: Adapting a unique in-house designed die on a ratchet.
Outcome:

- Quality issues. Stretches in gear knob.
- Productivity: Increased cycle time.
- Ergonomic: Hand not twisted. Ulnar deviation 13 degrees (max 15 degrees)

Prototype three: Create a jig tool (in house design and fabrication) attached to a torque control tool.
Outcome:

- Ergonomic: Wrist not twisted and ulnar deviation with in standard: neutral position (max 15 degrees)
- Quality: no issues.

Measureable Outcomes:
Improvement cost

- Material: 20 USD
- Labor cost 30 USD
- Total cost: 50 USD

Productivity savings

- Downtime: 20 sec Down time daily x 235 production days
- 4,700 sec annually = 78.3 min annually x 221 usd / min of production down time = $ 17,304.30 USD

Time to install gear shift

- Before improvement= 22 sec
- After improvement= 8 sec
- Time saved= 14 sec x 89,000 units / year = 346.11 hrs./year x 5.52 USD tm rate = $ 1,910.53 usd / year

Quality savings

- Knob Cost = 5.50;
- Scrapped knobs = 200
- ROI Total savings = 1,100 USD

Cost of jig = $ 50 USD

- Productivity savings = $ 19,214.30 USD
- Quality savings= $1,100 USD
- ROI = 40,530 %

Booth #: **118**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions with internal competitions)**
Title of Entry: **Back-up Axle Assist Hoist**
Location: **Toyota Motor Manufacturing America**
Georgetown, KY

Presentation Description: I am the GL of MA240 which is a Trim line at TMMK. On this Trim line we install all 4 axles. The axles weigh at least 70lbs each. During normal production we have 4 axle hoists that carry the axles to the car taking the burden off the TM. However there are abnormal situations that occur that require the axles to be manually lifted into place. These include weekly build backs, so that maintenance can do weekly preventive maintenance and any other repairs that are needed, and anytime there is a wrong, damaged, or missing axle.

Before the Axle assist hoist we had to manually lift the axles into the car using 3 TMs. Because of the weight we had strains to the TLs neck, shoulders, knees, and back. During a span of 135 build backs we had 3 injuries, including 1 lost time surgery. With help from our Smooth Motion Kaizen TM, I worked to develop and construct a mobile manual hoist that would take the burden off the TLs. After the axle hoist was implemented we have had over 300 manually build backs with zero injuries.

Problem: The problem was that we were manually installing axles on a very frequent rate, mostly due to build backs for maintenance. Each Axle weighs over 70lbs, so the old standard took three TMs to install 1 axle. During 135 manual installs we had 3 injuries, including 1 lost time injury that required surgery. We also had several neck, shoulder, and back strains. This process scored a 72 on our standard Safety Risk Assessment for non-routine processes. Any score over a 30 is considered a “red” or high risk process. The NIOSH Rating for this process was also no good. The NIOSH lifting standard is 13.8KG (30.4LBS) the Axles are 33.5KG (70LBS). I knew because of The TMMK Reborn activities and upcoming takt time changes the risk of injury would be greater because the amount of manual builds were planned to increase dramatically. I take the safety of my TMs personally so I needed to find a way to make this fairly common process more safe before any more of my TLs/TMs were injured.

Solution: I worked with my Smooth Motion Kaizen team to come up with a mobile manual hoist to take the 70lb burden off my TLs/TMs. We tried several designs before we settled on this one. This design uses a worm gear ran by a battery gun to lift and hold the axle into place. It has four

large rubber wheels that makes it very mobile so it can be used anywhere on the line and even in offline repair areas. The Assist Hoist also eliminates the need for 2 TMs to lift the axles. Reducing the manpower needed from 3 to 1.

Measureable Outcomes: By designing the Axle Assist Hoist we were able make a high risk process (72) to a low risk process (8). We improved the NIOSH rating from 33.5KG to zero. We have achieved Zero injuries/ESIs since implementation. Two TMs are no longer needed to lift the part from the floor using mostly their back and upper body. This has eliminated the possibility of injuries due to manually lifting the axles. The implementation of the hoist has nearly eliminated all mutilations due to abnormal axle install and has reduced total mutilation to the axle install areas by almost 50%. Calculating injury, saving 1 TM per build, and cost to repair mutilations the return on investment is over $48,805.00 per year. We have Yokotened this to all four Axle processes in line 2, CART Repair, and have presented the equipment for Assembly 1 and Lexus at TMMK to review. It was also entered in BPAKS for all NAMCs to view.

Booth #: **119**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions with internal competitions)**
Title of Entry: **The Pain Killers**
Location: **Honda Transmission Mfg.**
Russells Point, OH

Presentation Description: Associates have to confirm the rotation on the main shaft and third shaft of the transmission, and stake the flange nut. Initially it required two different fixtures requiring full arm rotation in each direction. If the flange nut was in the wrong orientation after the full rotational motion, associates had to reposition and repeat. Associates came up with a double-socket fixture with handles on both sides. This eliminated full rotational arm motion into more of a push-pull motion (socket style). Associates can also check the proper position of the flange nut through cut outs on the sockets in the new fixture.

Problem: The full arm rotational motion to check the smooth fit of the main shaft and third shaft in the automatic transmission, caused complaints due to the physical stresses to the shoulders, arms and wrists. The full rotational motion also created a long torque arm between the socket on the shaft and the hand placement on the tool fixture handle. This long torque arm sometimes caused the socket to slip off the shaft, resulting in the need to reposition the socket and redo the rotational motion. Additionally, having to change between two different tool fixtures for each of the shafts made associates struggle to keep up with the task cycle time through wasted motions of having to put down the first fixture and retrieve the second fixture.

Solution: Associates brainstormed and provided many ideas to improve the two fixtures, by focusing on improvements to the handle design. Finally they came up with a new fixture that combined the two sockets into one with two handles on either side of the sockets to transform the full rotational arm motion into more of a push-pull motion. They also added “windows” to

the sockets for visual positioning of the flange nut. The project was achieved by using in-house resources, the total cost for this countermeasure is only $225.

Measureable Outcomes: The full rotational arm motion was eliminated by using more of a push-pull motion stroke of the two handle design, which distributed minimal physical exertion over two hands and arms. The new "helicopter" fixture eliminated complaints of physical stresses to the shoulders, arms and wrists.

By having handles on both sides of the sockets, this made the fixture more stable over the shaft, preventing slippage, and avoiding the potential to strike the hands and fingers against the assembly and adjacent parts and workstation components. This also eliminated having to replace the fixture over the shaft, thus eliminating additional unnecessary motions.

Combining the two fixtures into one also resulted in approximately 15% reduction in the task cycle time. This eliminated the potential for associates having to struggle to keep up with the production line speed, especially when they fall behind in other process elements of the job that they have to complete.

Given that the cost for this countermeasure was only $225, the cost savings from cycle time reduction and the cost avoidance from potential injuries plus other benefits resulted in a payback of only 0.25 months (1 week).

The associates are thrilled with the new tool fixture and the reduced body stress

Note: This tool fixture design has been shared with our "sister" powertrain plant in Georgia for implementation.

Booth #: **120**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions with internal competitions)**
Title of Entry: **RSI Drift Assist**
Location: **Toyota Motor Manufacturing Canada**
Cambridge, Canada

Presentation Description: An automated ergonomic improvement to assist the TM in loading parts with no physical burden and eliminating the reach for the team member. All factors lowered significantly or eliminated completely.

Problem: TMs required to load a large RSI sub assembly part that weighs 8.2kgs in the cell over top of the wheelhouse at a reach of 864mm. The weight of this part combined with the extended reach created poor back and shoulder postures and lead to numerous injuries and claims of worker discomfort.

Solution: RSI sub assembly guides built and installed on an air cylinder support system. TMs now load the RSI sub assembly in an ideal loading zone that allows neutral body postures. Once the RSI sub assembly is located to the support structure the TM uses the foot pedal to release the air in the cylinder and lower the part into the final welding location. Reach required reduced to 457mm. TM no longer required to support the weight of the part.

Measureable Outcomes:
Safety - TM no longerhas to support weight of part when loading to final welding position. TM reach requirement reduced from 864mm to 457mm. (700mm max vertical reach). Back posture code reduced from 8 to 1. No injuries or worker discomfort claims since implementation claims since implementation.

Quality – Inconsistent manual loading of the RSI sub-assembly often resulted in bent or damaged RSI upper brackets. These brackets would go undetected until they reached assembly and would require major offline repair. Each hot work repair in assembly requires complete tear down of vehicle and the combined efforts of weld/paint and assembly team members to complete. 3 hours needed per repair. No defects since drift assist went online.

Productivity – No additional time required to use the drift assist when loading RSI sub-assembly. Manual load often created slightly damaged parts that would create faults and downtime down line.

Cost – RSI drift assist completed 100% in-house using materials from general stores. Major reduction in offline RSI upper brackets in assembly.

Yokoten (sharing improvements company wide) – Numerous locations across weld shop identified that can uutilize this loading method. North and south weld investigating. Toyota Indiana (TMMI) also requesting information package for possible Yokoten.

Booth #: **121**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions with internal competitions)**
Title of Entry: **The Enforcers**
Location: **Honda of America Mfg., Inc.**
East Liberty, OH

Presentation Description: Production associates initially used make-shift tools and vice grips to replace remove fasteners when making repairs to the license garnish to replace the “float nuts”. Completing these tasks with awkward postures resulted in high force exertions, putting stresses to the wrists and shoulders. There was a high potential for chips, scratches and deforms to the license garnish, leading to scrapped parts, and it took 4 to 6 minutes to complete the repairs. The team had a “revelation” with a creative idea of how to more easily remove the part clips.

They fabricated a new tool using this concept, which reduced the required force, minimized quality concerns, and cut repair time in half.

Problem: To remove and repair the license garnish, production associates at Honda's East Liberty plant had to use make-shift tools and vice grips to remove the fasteners and replace the float nuts. Associates used pinch grips and deviate their wrists while using these tools. These poor working conditions resulted in hand force exertions measuring upwards to 22 to 24 kg., well above Honda's internal guidelines for hand force exertions. This increased the potential for ergonomics-related injuries, as well as other safety incidents due to the use of tools that were not truly designed for these purposes. The use of make-shift tools and vice grips also increased the potential to damage the part or cause chips, scratches or deforms. On the average, associates ended up damaging an average of 23 license garnishes per year, resulting in high scrap costs. Additionally, the time to complete the repair work also averaged between 4 to 6 minutes. This was a team-driven project, and the associates in the area identified this problem as a high-priority to tackle based on the problems they personally experienced completing this work.

Solution: The team developed four ideas for special tools and fixtures to reduce the ergonomics and safety risks, while also minimizing the quality and production concerns. The team decided to proceed with an innovative tool design that basically reverses the action of how the fastener attaches to the license garnish. The team fabricated a hand-held fixture that holds the fasteners securely in place while popping out the clips with minimal effort using a plunger-type shaft on this tool. Using gravity, the shaft releases after the associates have popped out the clips. The team used scrap materials available in the machine shop and took two man-hours to fabricate this new tool.
The tool can also be easily modified for other parts and situations that require the removal of parts clips for repair work.

Measureable Outcomes:

- Safety- Reduced required hand forces by 90%.
- Cost- reduced amount of scrapped garnishes by 75%.
- Cost Savings- $20,000 annually.
- Production- Reduced repair time by 50%.

The use of the new tool practically eliminates the force requirements to remove the fasteners on the license garnish and replace the float nuts. With negligible force requirements, the potential for ergonomics risk is eliminated. The new tool also improves the hand and wrist posture to perform these repair tasks.

The new tool also eliminates the potential for chips scratches and deforms, allowing associates to reuse the license garnish after completing the repair tasks. This eliminates the high cost of scrap parts each year.

The tool allows associates to complete repair time in 1 to 3 minutes, at least a 50% reduction from the original 4 to 6 minutes of repair time.

Production associates performing these repair tasks now rate the job tasks a “2” on a comfort survey (again, on a scale of 1 to 10, with “1” being most comfortable and “10” being most uncomfortable).

The cost savings from scrap and time reduction and cost avoidance from injury potential elimination totals almost $20,000 a year. With practically no expenses to fabricate the new tool due to the use of scrap materials and the use of in-house labor, the payback period for this ergonomics improvement is basically immediate with an infinite return on investment.

The tool has been modified to fit future models with the same clip design. This tool will be able to be used at other plants that use these styles of clips. The only design change will be the handle shape to fit in different areas that the clip backside is sticking out. The handle design will be determined by the access holes to get behind the part/clip, but the concept of the tool will be the same.

Booth #: **122**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions with internal competitions)**
Title of Entry: **PW 814 LP Shaft Packaging Cutout**
Location: **Pratt and Whitney Canada**
Mississauga, Canada

Presentation Description: Employees at Pratt and Whitney Canada’s Plant 22 – Mississauga Operations collaborated to create a simple, yet effective, zero cost solution which completely eliminated the manual handling of a 32-kilogram part during engine assembly. The solution eliminated the potential injury cost, reduced cycle times by 30% and virtually eliminated the risk of part damage. These cost savings, combined with the zero cost of implementation, resulted in immediate payback and an attractive ROI. This solution was awarded 1st place in the “Frugal” category of the P&W Annual Ergonomic Innovation Awards for 2015, and the United Technologies Corporation EH&S award for Ergonomic Innovation.

Problem: During assembly of the PW 814 engine, employees were required to remove a low-pressure turbine shaft weighing 32 kg (70 lb.) from its cardboard packaging, and then install the part on a build stand using a lifting adapter and the zero-gravity manipulator. The problem was that there was insufficient space in the packaging to allow direct installation of the lifter on the shaft, so employees had to manually lift the shaft out of the box to install it in the lifter. Additionally, employees had to support the shaft with one hand while simultaneously securing the part in the lifter with their other hand. The high lift and high grip forces, combined with awkward neck, back and upper extremity postures, resulted in a high ergonomic risk score and likelihood of musculoskeletal injury. (The ergonomic risk score was calculated as 76 (high), using

the EJMS assessment tool.) There was also an increased risk of dropping the shaft due to poor coupling and heavy part weight, which could result in an employee injury or damage to the shaft.
No Technical Data

Solution: Based on the ergonomic concerns identified, a recommendation was made to cut out the PW 814 LP Shaft box packaging to accommodate the lifting adapter, so that it could be installed directly on the part. Meetings were held between the Plant 22 ergo team and PW 814 development key players to determine feasibility, and the decision was made to proceed with the proposed packaging changes. The dimensions of the lifter were measured and a mock-up of the required cut-out was created. The team then sent pictures of the mock up to the packaging supplier, who created a drawing of the new packaging design and made the necessary modifications. With the new packaging design, employees can now install the lifter directly on the part while it is still in the box, completely eliminating the manual handling component. After implementing this solution, the ergonomic risk score was reduced from 76 (high) to 20 (low). An added bonus was that we were able to implement the changes both at our facility and the sister Plant 15 production facility, helping to mitigate their risk.
No Technical Data

Measureable Outcomes:
Ergonomic risk score decreased by 74% (high to low)
- Injury cost savings ($83,385 x 5 years process life) $416,928

Cycle time decreased by 30%
- Cycle time reduction savings ($670/yr. x 5 years) 3,350

Damage prevention savings: $19,170

Total savings: $439,448

Since the cost of implementing the solution is $0, payback is immediate, and the ROI is $439,448
No Technical Data

Booth #: **124**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions with internal competitions)**
Title of Entry: **Pail SLUG**
Location: **PPG**
Oak Creek, WI

Presentation Description: The booth and display will be manned by knowledgeable employees who developed and use the new ergonomic solution. A Video will be created and displayed that showcases the problem, task at hand, solution and use of the tool. The tool will be brought to the conference for a hands-on demonstration with reading material to pass out.

Problem: At the end of the pail filling process, each pail must be shaken to ensure the material is well mixed before shipment. Each pail is manually loaded into the shaker, then lifted back out by the operator. The employee had to use a pinch grip to lift the pail approximately one inch out of the shaker base and then pull it onto a roller conveyer which is offset to one side of the shaker. Pails average in weight between 40 and 60 pounds, and an employee can lift up to 50 pails per shift.

Solution: Operators in the department raised the issue to the area mechanic. The mechanic thought he could design a device which was able to remove the risk for the operator pulling the pail out. After several renditions of a tool, gaining in-the-moment feedback by working side by side with the operators, the mechanic was able to create an effective tool that the department employees love to use, rather than pinching the pail rim with two hands and lifting in an awkward position.

Measureable Outcomes: A detailed Ergonomic Job Assessment was conducted using the Auburn University Ergo Tool. The EJA results were significant. The risk to each employee was reduced from a score of 23 down to 9. Another measurable outcome is the return on the investment of creating the tool:

1. Project Cost= $200.00 (primarily labor). The material cost was minimal as it was made from scrap metal in the maintenance shop.
2. Injury Savings= Assuming average cost of a soft tissue injury is $2000 (average from recent Architectural Coatings SBU data) and there are three primary employees performing this task.$2000 x 3 = $6000.
3. Production Savings= $0.00 (not including any lost time for injured employees).
4. ROI= $6000 - $200 = $5800 in the first year. ROI is less than two weeks.

Booth #: **125**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions with internal competitions)**
Title of Entry: **Seat Locker**
Location: **Honda of South Carolina Mfg Inc.**
Timmonsville, SC

Presentation Description: Honda of South Carolina is an automotive style manufacturing plant that produces power sports products. The focus of the theme was to eliminate poor back, neck, and shoulder posture with elbow abduction during rear seat installation on the assembly line. The solution was developed through multiple departments, this included the assembly, purchasing and maintenance departments.

The ergo cup team set their project goals to developing a device that improved the material handling, process efficiency and reduced ergonomic risk. The countermeasure is a huge success at our plant and was also implemented at the seat supplier in their assembly process.

Problem: The rear seats on the Honda Pioneer 1000 multi passenger line have a hatchback design to maximize vehicle space. The seat collapse's flat to save vehicle space when not in use. Great design for the consumer, tough job in assembly. The hatchback seats come from our supplier in a closed collapsed position to improve packaging. The seat is unpackaged and then placed inside the rear floor pan area of the vehicle.

Next the hatchback style seat has to be opened to install the 4 fasteners securing it to the frame. To finish the procedure the associate uses 1 elbow to lean down on the seat bottom and use the other elbow to push up on the seat back to keep the seat open for fastener installation. Opening the seat required 60-70 degrees of back flexion as the associate leaned into the vehicle, this posture was held until 4 fasteners were installed to secure the seat, total process time took 50 seconds.

Solution: The initial focus was to improve the material handling methods, as this would be the foundation to eliminating the ergonomic risk factors A 2" x 3" ¼" palm size plate was fabricated to hold the seat in the upright open position during installation. This would prevent the associate from leaning in the vehicle and eliminate the elbow abduction. To install the plate, the associate unpacks the seat and the plate is placed at the seat tensioner spring acting as a block, this holds the spring in the loaded position keeping the seat open in the upright position for installation. The next area of focus was improving process efficiency. As the plate was designed to hold the seat open, it was critical that a tool path was created in the plate so the associate could install the 4 fasteners and keep up with the assembly line speed. This clever tool eliminated the static back flexion and force that was required to lean down and push up on the seat to keep it open during assembly.

Measureable Outcomes: Safety- By eliminating the process step to hold the seat in the upright position, this eliminated associates from leaning inside the vehicle and the required elbow abduction.
Quality – Correcting the working posture has improved the line of sight while fastening the seat and reduced associate fatigue levels. The results showed a 60% reduction in cross threaded and broken fasteners on the assembly line.

Delivery- Process efficiency improved 30%. The process time was reduced from 50 seconds to 35 seconds

Material handling time was reduced by 70%

Costs- $78,100 was saved as a result of process efficiency improvements and reducing damaged fasteners during installation.

Morale – This process had high attrition and excessive amounts of rework and repairs. Associate stability has improved, line side management embraced the Safety and process efficiency improvements. This positive outcome was extended to our seat supplier as they use this tool while assembling the seats for Honda.

Booth #: **126**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions with internal competitions)**
Title of Entry: **Nutplate Ring Rivet Press**
Location: **Lockheed Martin Missiles and Fire Control**
Camden, AR

Presentation Description: A specialized fixture was designed, fabricated and attached to a pneumatic press and portable lift table to reduce the ergonomic risks related to repetitive and awkward squeezing of rivets, while enhancing PAC-3 MSE missile nutplate ring assembly process efficiency by 40%.

Problem: The nutplate ring is a critical component in the assembly of the PAC-3 MSE missile. During construction of the nutplate ring, 68 individual nutplates are attached to the aluminum ring by manually squeezing 136 rivets (one-at-a-time) with a heavy handheld thumb-operated pneumatic rivet squeezer. The setup of the workstation (operation performed on a standard workbench) required unsupported sitting, with the operator leaning forward with elbows spread away from the body. This manual operation created significant strain to the back, hand, wrist, and arm. In addition, rivets frequently squeezed incorrectly due to the variability in hand-motion and fatigue associated with manual squeezing.

Solution: The Nutplate Ring Rivet Press was designed and implemented. The final concept was brainstormed by the team, consisting of the assembler, tool maker and engineers, to use special

fixtures attached to a pneumatic press in order to squeeze 2 rivets at a time. This solution eliminated the strain from the back, hand, arm, and wrist, eliminating the repetitive manual "thumb squeeze" and allowing the operator to perform the improved task in a more neutral and supported seated posture.

Interchangeable parts were fabricated to accommodate the varied sizes of nutplates. Fixtures were designed, fabricated, and assembled on a mobile height adjustable station. The press was optimized and a hard stop was installed to provide a consistent squeeze. The device was equipped with a two-hand button actuator to safeguard from contact with any moving parts during operation.

Measureable Outcomes: Implementation of the Nutplate Ring Rivet Press yielded:

- 40% efficiency gain and associated increase in operational capacity, allowing two rivets to be squeezed at a time and reducing touch time by 1.95 hours per nutplate ring assembly.
- Elimination of sustained awkward hand, wrist, back, neck and shoulder postures, as well as elimination of static forces from constantly holding heavy tools and repetitive forceful thumb actuation.
- Elimination of rivet defects by providing a consistent repeatable rivet squeeze.
- Overall cost savings of ~ $170K over the life of the contract.

Booth #: **127**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions with internal competitions)**
Title of Entry: **Single-Minute Exchange of Dies**
Location: **GE Aviation - Engine Services**
Singapore, Singapore

Presentation Description: At GE Aviation plant in Singapore, machinists were required to perform chord trimming operation using a press machine (35 tons) and were exposed to various ergonomic risks when setting up the press machine. They would have to bolt and unbolt the manual clamps while mounting and dismounting conventional die sets. These job steps were associated with numerous ergonomic risk factors which were causing discomfort to employees. In addition, they were also required to handle the heavy conventional die set that weighed approximately 75.0 kg (165 lbs.). Even though a buddy system was implemented as it was the only way for the machinists to carry the die sets for installation on the press machine, there were lot of ergo and safety risks associated with the handling of the heavy dies. After the ergo evaluation results and concern reports from site employees, the area team came up with the new concept using Single-Minute Exchange of Die (SMED) principle after several iterations. The new solution significantly brought down the ergo and safety risks and improved the productivity results.

Problem: The objectives of this project were to determine the ergonomic risk level and implement solution to minimize the ergo risks. Video-based observational techniques were adopted to conduct the ergonomic evaluation. The Ergonomic Risk Identification Form (from an array of GE Ergo Tools) was used to identify ergonomic risk factors such as awkward or static posture of body parts, repetitive motion, forceful exertion, vibration, contact stress, extreme cold temperature etc. While Manual Handling Tools such as Pull and Carry Calculators were used to conduct psychophysical analysis involving heavy load.

The GE Ergonomic Risk Identification Form revealed the task of setting up press machine was a high-risk activity with total score of 30 risk factors. These risk factors were primarily due to upper limb intensive tasks which involved wrist flexion with pinching to bolt and unbolt, awkward posture of twisted back, forceful exertion to unscrew etc. The initial and sustained forces were found to be 25.0 kg and 14.0 kg respectively while handling the dies in the press. In addition, through the Carry Calculator it was found that the maximum acceptable weight was 18.0 kg. These results were much lower that the weight of the conventional die set.

Solution: The risk assessment results and further brainstorming sessions pointed that the conventional die set should be redesigned ergonomically to eliminate the risk factors. We improved and streamlined the set-up of conventional die set by introducing the concept of Single-Minute Exchange of Die (SMED) to reduce these risks. SMED is new innovative concept and different from conventional die sets available in market as SMED is light weight, less time consuming and requires less manual setup thus reducing ergonomics risk significantly.

Measureable Outcomes: The implementation of SMED simplified the set-up steps by making the die set lighter (from 75.0 kg (165 lbs.) to 7.5 kg (17 lbs.)) and eliminated the repetitive motions of bolting and screwing which also took care of the postural risk factors and manual handling of conventional die set. The ergonomic risk factors were reduced from high to low risk (from 30 to 8). We re-evaluated the pulling and carrying tasks and the results were well below the acceptable limits. Moreover, the set-up of die set on press machine is now simpler and faster, reducing the changeover time from 30 minutes to 1 minute which significantly improved the productivity of the operation.

Booth #: **218**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions with internal competitions)**
Title of Entry: **Tire Chocks**
Location: **Coca-Cola**
Akron, OH

Presentation Description: Wheel chocks (or chocks) are wedges of sturdy material placed closely against a vehicle's wheels to prevent accidental tire movement. Drivers are required to place chocks in front of their tires whenever a trailer is backed into a dock and removed before the trailer is pulled away from the dock. The modifications made to the chock are eliminating

the stooping postures and mitigating the force required to conduct the task. These modifications include a handle and two casters placed on the lateral side of the chock. The user simply grabs the handle (at waist height), tilts the wheel chock back on the casters and then rolls the wheel chock into place. Modifications to the current distribution center chocks costs $11.50 and have the ability to affect 2,100 “yard” employees company wide. A follow-up Brief/Best Assessment was conducted and received a total score of .8 Low Risk Task.

Problem: During this task, awkward posture (trunk flexion) was observed when employees removed to add the chock to the destined location. Each chock weighed 15 pounds and presented a poor coupling factor. During the course of a 12 hours shift, a “DC yard” employee conducts this task over 95 times, bringing their individual annual frequency to 24,700 repetitions. In addition, each chock weighs about 15 lbs. and had no handle to assist in the lift. A Brief/Best risk Assessment score was conducted and received 13.6 Medium Risk Task.

Solution: The modifications made to the chock are eliminating the stooping postures and mitigating the force required to conduct the task. These modifications include a handle and two casters placed on the lateral side of the chock. The user simply grabs the handle (at waist height), tilts the wheel chock back on the casters and then rolls the wheel chock into place. Modifications to the current distribution center chocks costs $11.50 and have the ability to affect 2,100 “yard” employees company wide. A follow-up Brief/Best Assessment was conducted and received a total score of .8 Low Risk Task.

Measureable Outcomes: 24,700 stooping postures were eliminated annually for each employee conducting the tire chock process. Time savings sum $40,000.00 per facility that uses the new process. Brief/Best Humantech risk assessment was reduced from 13.6 to .8 (low risk).

Booth #: **219**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions with internal competitions)**
Title of Entry: **Notch Finishing Operation Mini-Liquor Cabinet**
Location: **Gulfstream Woodshop**
Pooler, GA

Presentation Description: The Custom Group of the Gulfstream Furniture Center builds a Mini-Liquor Rack that requires additional finishing operations after it is cut in the CNC department. The notch finishing job had always been done by hand using a broach tool that had been modified with a file handle. The tool had been originally designed to be used in a machine and required significant force from the technician to drive it thru the part. A new employee had recently inherited the job, who had back issues that were being exasperated by the force needed to drive the tool thru the part. Which drove the employee to develop a fixture that housed both the part and the tool securely and used mechanical advantage in the form of a long lever arm attached to the end of the broach tool and the fixture to drive the broach thru the part. This simple fixture reduced the eTools score from 23 to 9.

Problem: Employees had to bend forward and extend their arms to move the broach tool through the part. The motion and the force of gripping the tool's handle put excessive pressure on the technician's shoulder, upper body and back.

Solution: Jeff Thompson, a senior cabinetmaker, designed and built a fixture out of surplus materials that houses the broach tool and securely holds the part in place during the broaching operation. The fixture includes a long lever arm that attaches to the broach tool reducing the amount of force needed to move the tool by 75 percent.

Measureable Outcomes: An eTool's score reduction of 14 points was achieved along with improved quality on the notch in the finished part.

Booth #: **220**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions with internal competitions)**
Title of Entry: **Double Bottom Back Saver**
Location: **Coca-Cola San Antonio TX**

Presentation Description: Many Coca-Cola truck drivers are involved with “double-bottom” transportation; where an auxiliary axle equipped with a fifth wheel is connected to a lead trailer of a Semi-Truck so that a second trailer is added to a single operation. The piece that allows this connection to take place is called the “double-bottom” better known as a converter dolly with tractor trailer wheels.

Problem: When deliveries call for a second trailer to be added to the Semi, employees had to pick up the front side of the dolly, roll it to the back of the lead trailer and lower it onto the lead trailer hitch. The force required to lift the front end of a dolly is over 120lbs and the initial pull forces are near 160lbs, assuming the dolly is on flat ground. On an average day, 16 trailers are required to either be assembled or detached from lead trailers. The BRIEF/BEST risk assessment score yielded a 67.4 High Risk Task, based on the awkward postures of the wrists, back and arms, the excessive contact stress on the hands and large amounts of force while maneuvering the converter dolly.

Solution: The “Double Bottom Back Saver” was designed and developed by an employee out of the San Antonio, TX. This solution is a steel block that allows the converter dolly to attach to an electric pallet jack. Employees using the back saver, guide the attached tool to the pin of the converter and lock it into place. This significantly reduces the amount of manual handling task involved with the operation and allows employees to move the heavy converter dolly’s with a push of a button on the pallet jack. The overall risk from the BRIEF/BEST survey was reduced to from 67.4 to 8.3.

Measureable Outcomes: The overall risk from the BRIEF/BEST survey was reduced to from 67.4 to 8.3. An average of 3 injuries occurred annually prior to the implementation. Since, no injuries / recordables have been created. Time savings amount to over 104,000 annually.

Booth #: **221**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions with internal competitions)**
Title of Entry: **Pryed and Joy**
Location: **Bridgestone Warren County**
Morrison, TN

Presentation Description: A hoist was added at belt cutter #4 to aid in removing jam ups. The G-417 slab stock compound creates jam ups in the hopper. Operators have to use a crow bar to push and pull jam ups out of the extruder. Ergonomic risk reduced with the removal of pry bar. Problem: G-417 rubber jams up in the hopper at the belt cutter #4 twice daily. Operators had to remove this stuck rubber by using a 4.5 ft. pry bar that weighs 12.5 lbs. causing strains on various body parts.

Solution: Trailed rubber adding polyisoprene to soften to rubber in hope eliminate the jam ups. We also cut rubber 3 ways instead of in half and added a hoist to pull stuck rubber from the hopper.

Measureable Outcomes: Removed the pry bar from the operator to reduce the risk of strains. Cut down on the loss of production time by 50% from 25-30 minutes to 10-15 minutes.

Booth #: **224**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions with internal competitions)**
Title of Entry: **Clean In Place Removal Tool**
Location: **Coca-Cola**
Portland, IN

Presentation Description: When new drink flavors are to be produced, a CIP (clean in place) process must be conducted on all product lines. The process includes the installation and removal of a plastic cup/cap into the bell housing of a filler valve and also a metal clip be installed to keep the plastic cups/caps from falling out of the valves during the cleaning process.

Problem: When new flavors are to be produced, a CIP (clean in place) process must be conducted on all product lines. The process includes the installation and removal of a plastic cup/cap into the bell housing of a filler valve and also a metal clip be installed to keep the plastic cups/caps from falling out of the valves during the cleaning process. Once the CIP is complete on the filler, operators are required to pull up on a metal bar that is located on top of the metal

clip. Due to the narrow distance between each value, operators have difficulty reaching the bar which releases the cleaning caps. The traditional process included operators using their fingertips to pull up on the metal bar with a minimal force of 4.3lbs. A total of 67 facilities conduct this process 5 times a week, with 72 values needing to be lifted; annually 24,120 metal bars are lifted and lowered using employee's finger tips. The BRIEF/BEST score was 45.0 high risk.

Solution: The CIP tool consists of two aluminum sheaths and a fixed handle which allows the operator to slide the tool between two CIP valves. The spring action lever on the tool allows the metal bar to be either lifted or lowered with the squeeze of the fixed handle. In addition to the hand/wrist risk, the CIP tool increases productivity by saving employees at each location a collective total of 43.3 hours a year (10 minutes x 5 CIP per week= 50 minutes per week x 52 week). The BRIEF/BEST score decreased to 4.0 Low Risk.

Measureable Outcomes: A total of 43.3 hours / year have been saved for each employee using the tool. A total of 65 employees across the country have the opportunity to use the new tool and process. Risk scores were dropped from 45 high risk to 4 low risk, using the Humantech Brief/Best assessment.

Booth #: **225**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions with internal competitions)**
Title of Entry: **Keeping It Simple**
Location: **Bridgestone Warren County**
Morrison TN

Presentation Description: We run multiple tire sizes on machines and thus there is a need for machine adjustments during these changes. The highest ergo risk task was moving our #3 stitchers in/out for the different tires. There was potential for neck, back, shoulder, wrist, and finger injuries during the adjustment of these stitchers. When addressed a technician who performed the job, he asked if we could split the difference and create a location between the previous 2 and eliminate the high risk adjustment. This worked great so we modified all 39 machines and informed a sister plant of the improvement.

Problem: Set-up Technicians were having to move #3 stitchers and brackets at least 10 times a day during size change activities. These stitchers/brackets would require the technician to extend awkwardly and bend over while trying to slide the bracket or beat it into its location with a hammer while in this position. The high potential for multiple ergonomic issues and smashed fingers/hands making this a high priority item.

Solution: A set-up technician asked why we could not split the difference on the stitchers by drilling new holes and then we could eliminate the task entirely if it was successful. We had a maintenance technician drill new holes on a PM and then had our technical services department

ensure the quality of the stitch. The trial was extremely successful and became something we pushed for approval. We made this simple, yet effective modification to all 39 machines and shared it with our sister plant in Lavergne, TN to eliminate this ergonomic risk.

Measureable Outcomes:
Safety- We no longer have to move #3 stitchers on our size change.
Quality- Creating the new location of the stitchers resulted in zero quality issues.
Delivery- We save approximately 30 minutes every time we do these size changes which increase output by up to 10 tires per size change. That is a production increase of up to 100 tires per day.
Cost- This project cost the company $45.00 per machine. 39 machines were modified for a total cost of $1,755.00.

Booth #: **419**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions)**
Title of Entry: **Automated Run Out**
Location: **Yamaha Motor Mfg Corp - Georgia Advanced Metals**
Newnan, GA

Presentation Description: The Run Out station is where the final quality inspection is done for Georgia Advanced Metal's Steel Wheel Line. This station experienced two injuries in 2015, one repetitive motion and one slip/fall. The team was challenged to upgrade their old technology, improve the ergonomics & safety, and to accomplish both of those without purchasing an off-the-shelf machine at the cost of $250,000. The team was successful in designing & building a piece of equipment in-house that met all of their goals within six months.

Problem: The end of the Steel Wheel Line at GAM (Georgia Advanced Metals), called the Run Out station, is where wheel quality is checked before packing & shipping. The wheel had to be lifted, rotated and visually inspected, placed on rotating fixture, spun by hand while watching 4 dial indicators for in/out of range, then lifting the wheel again and placing it on a pallet. Wheels weigh approximately 5-14 pounds each. Ergonomic risk factors include: lifting, rotating, spinning, and lifting again for 1,000 wheels per day. The team identified high ergonomic risk for the trunk & elbow injury, as well as moderate risk for a shoulder or wrist injury.

The Run Out station had a number of problems that needed to be addressed. In addition to the identified ergonomic risk, there were two injuries in this area, one repetitive motion shoulder injury (attributed to spinning the wheels) and one slip/fall that cost the company nearly $50,000. The slip hazard was inherent to the process, because rust preventative was applied before the wheel was rotated & spun, dripping a mixture of oil and water on the floor. The process used at this station was 14 years old and was not aligned with current market technology. There was no data collection for process improvement or tracking and there was a recent case where the technology used did not identify the defect and allowed it to escape.

Solution: To address the issues at the SWL Run Out station, the team developed a machine to perform the Run Out check and redesigned the work area. The machine is able to perform as well as current leading market technology, without the cost & space required. The machine & components were designed and built in-house, while the software was custom created by a contractor. Cost to design & build the Run Out Tester was $27,000, compared with $240,000 for an off-the-shelf machine.

The new Run Out machine spins the wheels automatically, collecting data and giving a read-out on the screen to the operator of "in" or "out" of specification. This eliminates the operator having to spinning the wheel manually. The team was able to redesign the space to cut down on walking & carrying. They were able to relocate the rust preventative application to after the inspection, reducing the oil & water on the floor, making the area cleaner and reducing the slip/fall hazard. They placed the pallet dividers on a re-purposed lift table to raise them into the proper lifting zone. They implemented job rotation to further reduce the repetitive lifting of the wheels.

Measureable Outcomes: Outcomes achieved by building the Run Out Tester in-house include a total cost avoidance of approximately $272,500.

Total savings is made up of:

- Cost avoidance of $222,500 (leading market technology off-the-shelf machine)
- Implementation of quality dept data collection
- Cost avoidance of $50,000 by preventing future repetitive motion injuries
- 5S area improvements (quantified as a 60% improvement)
- Job Hazard Assessment score improvement of 59%
- Ergo Easy Tool score improvement of 64% (from a Moderate risk 75 to a Low risk 30)
- Cycle time improvement of 7% (20.6 seconds to 19.2 seconds, station was not a bottle-neck, so monetary value was not calculated)

Booth #: **421**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions)**
Title of Entry: **C-Squeeze Glide Redesign**
Location: **UTC Aerospace Systems**
Jamestown, ND

Presentation Description: The Presentation will describe how the Jamestown UTAS Aerospace Systems facility employees worked as a team to solve age old problem of exerting excessive forces and manually handling a tool. The presentation will highlight how they came together to come up with simple and effective improvement that eliminated high ergonomic risks and

injuries. The Team used the BRIEF ergonomic assessment to calculate an 81% reduction in risk scores.

Problem: During the assembly of a roller tray a reinforcement plate that has an average length of 15 feet and average weight of 20lbs is riveted onto the bare tray. This step in the assembly process was done manually by five of our employees for over 20 years. These five employees would manually holdi the 8 lbs. squeeze perpendicular to the tray at each rivet location with precision to not allow the squeeze to drift off of location. Thousands of rivets are installed on a daily basis by each employee. This one step in the process caused musculoskeletal stress in the employee's hands, shoulders and back from the "Hungry head", awkward postures, and static posture for extended periods of time. The site has had several employee report pain and discomfort from performing this job. The company even implemented job rotation to alleviate the physical demands before this redesign was implemented.

Solution: The team worked for 2 months with the Manufacturing Engineer and designed 3 prototypes to create a fixture that has the capability to support the 8 lbs. weight of the C-squeeze tool that also eliminated the need for the employee to hold the c-squeeze. The final design was sent to the Tool Design department for fine tuning. The Tool Design group made some modifications to the prototype to allow c-squeeze fixture to be height adjustable tool and glide along the assembly work station. This eliminated the hungry head postures and reduced the need to manually squeeze the tool. The cost of this custom fixture was about $5000 per unit.

Measureable Outcomes:
Zero Injuries since implementation
81% reduction in BEST score
Reduction of 15 minutes of manufacturing time per unit
Estimated net benefits(using ergo plus ROI tool) after 3 years= $168538

Booth #: **518**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions)**
Title of Entry: **Driver Reach Tool**
Location: **Coca-Cola Refreshments USA Inc.**
Akron, OH

Presentation Description: Display will include before and after videos of the many uses for Driver Reach Tool. There will also be hands on examples of uses for Driver Reach Tool available. Problem: The tasks which a driver-merchandiser is frequently called to perform require bending over to reach items at ground level. Some of these tasks are flipping the latch while locking trailer door, moving portable dock plates, placement of tire chocks, moving empty pallets

around in trailer, picking-up falling transport carts and many more. These awkward postures (stooping) have summed over 175 times daily for most drivers performing normal job tasks.

Solution: In learning the 'power-zone' lesson and looking into handle designs for power-grips, the Driver Reach Tool was created. This tool is approx. 23'' in length, has a small curved hook at one end and a T-handle at the other end for gripping. With most of the required tasks involving loads of less than 10 pounds (aside from lifting the weight of the body), it made sense to build a capability that allows the employee to remain up-right and eliminate the stress on the back. The Driver Reach Tool allows users to flip latches on trailer doors, move dock plates, correctly place tire chocks and most other ground level task without stooping forward.

Measureable Outcomes: Several risk assessments have been conducted using the Driver Reach Tool and all have reduced overall risk. A specific example that was assessed is moving empty pallets on the truck bed reduced from 28 (high risk) to 4 (Low Risk). Additionally, the Driver Reach Tool has increased productivity, allowing driver merchandisers to shave approximately 15 minutes off their daily routines. We use approximately 30 drivers per day at the Akron facility. The amount of time saved per day at Akron equates to roughly 8 hours per day or 40 hours per week. We are sharing this information with other facilities within our Market Unit and also throughout North America. If we can encourage 400 drivers throughout our company to use our Driver Reach Tool on a daily basis, it would result in a reduction of approximately 100 total man hours per day and greatly reduce the amount of physical strain on these individuals which would ultimately reduce opportunity for injury. Also, the expense of creating this tool is $15 or less so the ROI is great.

Booth #: **519**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions)**
Title of Entry: **Crane for Back Pain**
Location: **GE, A Haier Company**
Louisville, KY

Presentation Description: A SIZE box weighing 32.2 lbs. had to be removed from the material, causing the operators to lift 49.8 lbs. of force, EE has to lift 77in high up to 15 times per day. The box had to be lifted straight up due to the configuration of the material and the box could not be cut safely due to the thickness. A roll up crane was designed to fit perfectly over the box. The wench would be lowered to the top of the box lid, secured to the lid, and safely lift the lid from the box by turning the wench. After removing the box, the crane is rolled away and the box is released from the handles and ready for the forklift to take it to the proper location to be recycled.

Problem: Employees had to lift a 48in long X 49.5 Tall X 29.5 wide over head and the weight of box was over 30 pounds. height, lifted over shoulder, lower back, posture issues were identified on the ergo assessment. This task resulted in two lost time cases.

Solution: The team fabricated a frame to fit over the box and put it on casters. A wench crane was attached to the frame that allowed the employee to safely roll the frame over the box and use the crane to lift the box from the material. The employees are extremely thankful to the team and say that this change has made a world of difference and made their job so much easier!

Measureable Outcomes: There were two lost time accidents prior to the implementation of this crane, resulting COST FROM OSHA COST OF INJURY DATA. The crane was implemented approximately 1 year ago and there have not been any injuries from lifting the box since. Combined total cost $94,700 Sales needed to cover Total cost $3,156,666

Booth #: **520**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions)**
Title of Entry: **"Unsticking" a Sticky Lifting Situation**
Location: **The Estee Lauder Companies - Alden Manufacturing**
Markham, Canada

Presentation Description: The Estee Lauder Companies' Alden facility produces cosmetic compacts for many brands within the Company. Small aluminum pans hold the pressed powder within the compact but must be glued to the compact's outer casing. Employees developed an innovative way to avoid manually dispensing glue. Instead of lifting an open 20kg container of glue to fill 250ml glue bottles, an automated dispenser was developed in-house.

Problem: Previously, the task of filling 250ml glue bottles required two staff members 20 minutes to fill 10 glue bottles. This work involved lifting a 20kg container of glue to carefully pour glue into multiple 250ml bottles for use on the assembly line.

Solution: The solution was the development of a dispenser that automatically fills the smaller bottles, no longer requiring staff to lift the heavy container and eliminating the risky ergonomic behaviors. Two in-house mechanics developed the dispenser which is basic glue pump that was outfitted with a custom nozzle bracket in order to fit the small bottle underneath. A simple ball valve with a lever was added to dispense the glue via an air pump utilizing a quick-connect fitting. A staff member simply holds the bottle under the nozzle and pulls the level until the product container is filled to desired height. The solution cost zero dollars and approximately 6 hours to develop.

Measureable Outcomes: This employee-driven effort helped to achieve several benefits including risk reduction, reduction in cost and improved quality. Lifting the 20kg bucket and bending to pour the contents into smaller containers has been eliminated. The task now needs only one employee and is completed in half the time. Lastly, the glue dispenser is more accurate during the filling process thereby reducing the amount of spilled glue. this also speeds up the glue filling process by ensuring the glue bottles stay clean and no extra time is needed to clean them off.

Booth #: **521**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions)**
Title of Entry: **Posture Pleasing Carousel**
Location: **GE Appliance a Haier Company**
Louisville, KY

Presentation Description: We will be making a small model of the carousel that we made to bring with us. We will have before and after posters. We will have a video of the before and after the improvements We will bring posters showing how this was done with the team work of in house maintenance, ergo leader, lean team and KPO. Everything was done in house with no out side help. We will show the injuries, the cost from injuries, the small cost of the fix, the simplicity, and the out come. We will have a poster to show our facility, as many people don't know that GE Appliance is no longer with GE the company, but is now a Haier Company. We will make a one page summary of our project to hand out

Problem: Operators were holding washing machine backsplashes weighing 3.2 pounds in there supinated right hand. Then taking their left hand and plugging in 4 connectors with their left hand with pinch force of 8 pounds. This was causing a force of twenty pounds to be pushing down on the supinated hand and wrist. All of this while the operator is trying to keep moving with the moving assembly line. With the backsplash in their hand the operator was looking down all day causing neck flexion as well. This was being done 1580 times per day. We started having operator complaints and injuries to the wrist, elbow and neck.

Solution: The operators called for the ergo leader and lean team to come out and evaluate the job. Together the Lean team, KPO, Ergonomic leader, engineers, and maintenance team worked together and came up with the idea of a " CAROUSEL" . This carousel would hold the backsplashes with the back side facing the operator while the operator was pushing in the connectors. This allowed the wrist to be in a neutral position and all weight taken off the wrist and hand. It also eliminated the supination of the left hand. With the carousel holding the backsplash out in front of the operator the need to look down was eliminated as well. The operators would not have to use their hands as a table any longer.

Measureable Outcomes: We had a total of thirty two operators that would do this job with the rotation, two lines running and two shifts. If just one operator would get hurt it would cost the company $30,000.00 for direct cost and $33,000.00 for indirect cost, for a total of $63,000.00. The company would need to do an additional $2,100,000.00 to cover the cost of this injury. With the help of the carousel the company was able to decrease the number of operators needed on that job and saved an additional $260,000.00 per year. The number of injuries and complaints went from four to ZERO.

Booth #: **525**

Category: **Workplace Solutions I (Team-Driven Workplace Solutions)**
Title of Entry: **Extra Hand**
Location: **Gulfstream Aerospace**
Long Beach, CA

Presentation Description: The "Extra Hand" was created to eliminate wrist, neck and back pain when installing the arm rest on our aircraft cabin seats. These arm rests have to be wired prior to installation and it takes an "extra hand" to hold the arm rest and wire the components at the same time. Most of the human beings we hire do not come equipped with a third or "extra" hand so we created one out of scrap products, materials and an inexpensive cam lock handle. This innovative tool allows us to install the arm rest in the shop or in the aircraft itself during any follow on maintenance quickly and with less pain.

Problem: Installing our aircraft cabin seat arm rests was very cumbersome. It was causing wrist, back and neck pain based on the awkward positions our technicians were having to get into to install the seat arm. This installation was also taking more time to complete due to the awkward nature of having to hold the arm, wire it, and line up the bolt holes to tighten it down with only two hands

Solution: We repurposed a computer monitor stand due to the geometry and strength it provided. We then fabricated a sheet metal cradle to attach to that stand to hold the arm rest itself. This tool would allow us to install the arm rest in the shop or in the aircraft itself during any follow on maintenance.

Measureable Outcomes: We have improved the time spent installing both arm rests on each seat by approx. 25 min. (Productivity) This also reduces the risk of damage to a very expensive aircraft component. (Quality). The cost to assemble the seat has been reduced with an estimated savings of approx. $6,000 per year based on 15 aircraft. The total risk score reduction from the e-tools assessment is 15 points per seat x 12 seats per aircraft = 180 points per aircraft. We have also been asked by our other sites to fabricate a tool for them to mirror the gains we have experienced.

Booth #: **527**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions)**
Title of Entry: **Tail Camera Alignment Tool**
Location: **Gulfstream Aerospace**
Dallas, TX

Presentation Description: It was difficult to align the camera on the tail of the G280. A lot of effort spent on tweaking the camera and a lot of rework if the alignment was not done correctly the first time.

Problem: The tail camera installation requires 3 people for alignment. Often time, the alignment needs to be tweaked because it's done by eyeballing and guess work. It's hard on the wrists, neck, back and lower body to adjust the camera and rework.

Solution: A tool was created to make the job much quicker, easier and less effort on the body.

Measureable Outcomes: Risk score reduction from 18 down to 4
ROI: payback is 2.5 months and a cost savings of $16,775/year

Booth #: **619**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions)**
Title of Entry: **Ergonomic Risk Reduction for the Sutupack Process**
Location: **Ethicon, Inc.**
Cd. Juarez, Mexico

Presentation Description: Ethicon Company fabricate medical product used on surgeries, on Juarez facility 80% of the process are sutures. Sutupak product consists in non-needle sutures with specific dimensions cut from a spool and winding in a folder as final presentation. During an ergonomic review it was identified 3 high ergonomic risk (shoulder related) therefore it was decided to redesign the process, a multitask team was integrated to start this project, after one year of development Equipment Suture Automated Cut and Dispense for Sutupak SACDS design was completed. SACDS solve ergonomic risk found during assessment and involved another process solutions.

Problem: Sutupak station required to take the suture form the left side causing reach across the body, because of the length of the suture the employee need to abduct the shoulder to reach requirement, additionally the operators with the same right arm make a flexion to start the winding process. The standard requirement is 1020 pieces per 9 hour shift making it a shoulder repetition of 2040. After the ergonomic assessment was concluded 3 main risks was found: Shoulder Abduction, Shoulder Flexion and Reach Across Body. Even though we have a two hand technic it was not wide accepted and only eliminate the reach across, therefore Engineering control was required to find another solution. During the previous process operation we had several complaints, and Two operator were restricted by the medical department.

Solution: Multi-functional team conformed by manufacturing, quality, engineering, and EHS to review the process, and after several meeting and brainstorming a possible solution was found; based main driver suture dispense process and repetitions, it was decided to semi-automated the dispense process. Proposal was presented with local integration companies, one option was selected and then investment justification was conducted over $ 250,000 USD required for the implementation. Semi-automatic design reduce the ergonomic risk, equipment use a spindle to give the suture length required, cut and dispense. Operator take the suture and wind into the folder; depending the suture length requirement spindle can be exchange by a minimum effort because a design Single Minute exchange die (SMED) on the holder system, additionally the

wind and dispense station were center to allow right/left hand person can conduct the operation easier.

With this new semi-automated process additional benefits were: reduction of floor space by 500 sq-ft because of the compact design, also obtain a total of $125,000 USD in savings because the utilization of a spindle to give the suture length requirement, previously the variation was 1.5 inches extra by each suture with a volume of 4 Million yearly pieces and the new design reduce until 0.05 inches. Also 40% of the process cycle time was optimized because the elimination of the dispense process, this allow the company to relocate the associates into other operations and reduced from 18 to 16 associates.

Measureable Outcomes:

Metric	Improvement	% Improvement
1. SAFETY	Reduction of Ergonomic Risks	60%,(3 out of 5 risks)
	Medical restriction	100%
2. QUALITY	Suture Length	100% (reject by lower spec)
3. COMPLIANCE	N/A	N/A
4. DELIVERY	Reduction of cycle time	40% (elimination dispense, 2 head
	count) Layout	50% (500 sq-ft)
	Length Tolerance reduction	10% ($125,000 USD)
5. COST	Productivity $250,000	

With a total of $ 250,000 USD for 8 equipment the benefits non ergonomic complain year today, and also $125,000 USD in savings with a return of the investment of two years.

Booth #: **620**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions)**
Title of Entry: **Push it ! Real good.**
Location: **Johnson & Johnson Vision Care, Inc.**
Jacksonville, FL

Presentation Description: The shredder bin is a locked container with a small opening that holds damaged product. Operators would struggle when sliding / pushing damaged product into the small opening. This led to possible injuries to the hand, knuckle, elbows and shoulders. Operators were complaining of fatigue. Damaged product would build up in front of the bin, not

allowing product to fall toward the back. Weight of lifting/tilting bin, 28lbs. Due to operators concerns, the bin was unlocked and a push tool was created. The risk score went from 16 to Ø. This eliminated fatigue and high risk for an injury.

Problem: Damaged product would build up in front of the shredder bin. Possible injuries to the hand and knuckle areas when hitting metal edge as well as strain and fatigue on elbows and shoulders. Lifting up and tilting the shredder bin back and forth (4) four times each evolution repeated up to (6) six times daily for a total of 24 times per shift; max weight of 28lbs. Using the evaluation system E-TOOL, the risk score was determined to be Low at 16, however, there was still a potential high risk for an injury to occur to hands and knuckles and complaints of fatigue to shoulders and elbows were common.

Solution: Operators spoke with management about unlocking the bins, which was agreed to and came up with a design for a push tool. The tool was created out of scrap material by the maintenance department. The push tool weight is 1.4 lbs. and is used to push the damaged product toward the back of the shredder bin. Total score is now zero. Unlocking of the shredder bin and having a large opening eliminates possible injuries to the hand, knuckle area also strain and fatigue on the elbows and shoulders when lifting and tilting shredder bin. The new change reduced the risk score from 16 to zero.

Measureable Outcomes: The new process eliminates possible injuries to the hand, knuckle area when hitting metal edge, also strain and fatigue on the elbows and shoulders. Push force to use the push tool to push damaged product to the back of the bin is 6lbs. or less. Ergonomic risk score of zero from a previous risk score of sixteen (16). Operators are happy that management listened to their concerns and gave them the latitude to come up with a simple, innovative solution.
Scraps Material in house: cost $

Booth #: **621**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions)**
Title of Entry: **Coolant Cart Ergo Improvement**
Location: **DePuy Synthes**
West Chester, PA

Presentation Description: The DePuy Synthes Brandywine manufacturing site uses CNC machining centers to produce internal and external orthopedic fixation devices. Each CNC machine center requires either petroleum based or water based cutting fluid to keep cutting tools from overheating. The previous method of replenishing the cutting fluid in CNC machines

was to fill two five gallon buckets with proper coolant, the buckets would then be transported by push cart, manually lifted and poured into the CNC machine.

Problem: First, the transportation of these coolants in open buckets created a slip and fall hazard if the coolant was spilled during transportation. Second, each bucket typically weighs 45 pounds. The operator then needs to lift the bucket from the cart at floor level, sometimes in very confined spaces and /or with an awkward posture up to chest level, before pouring it into the machine. Third, this operation takes place at each machine at least once per day and was performed by as many as 200 employees.

In the past, this operation has led to several injuries and discomfort. In the recent years, one of our employees suffered a bicep tendon rupture while he was lifting the coolant bucket. The employee was out of work for several days and had to undergo surgery. Another employee suffered from back pain after performing this task. At one of our sister sites, a similar incident took place where an employee suffered a back injury lifting the coolant bucket and was out of work for several days. This operation was surveyed as a High Risk using our internal ergonomics risk assessment software (Auburn Engineers Etools).

Solution: The ergonomics team, comprised of all production personnel, took up the challenge to investigate potential solutions. Several solutions had been submitted and were being discussed at weekly meetings. One of the last ideas came after much discussion with the machine operators. The suggestion was a caddy similar to the gas and oil caddies used in the automotive and racing industry. After purchasing a prototype caddy, weeks of testing, open discussions with the machine operators and a number of modifications to enhance the caddy's ergonomics, portability and durability, the team decided on the final solution. Each caddy after modifications cost less than $600.00 and are color red or blue (Blue for water based and red for petroleum based). The caddy is easy to move around, greatly reduces the ergonomic risk to almost zero and its high flow pump allows to the task to be performed quickly.

Measureable Outcomes: This solution was implemented at the West Chester site, eliminating the use of buckets and the ergonomic risk associated with lifting them. The solution was also shared with our two sister sites and they are in the process of implementing the same solution. We have had zero injuries or complaints or discomfort related to the filling of cutting fluid since implementation of this solution. Also, a new ergonomic risk assessment now shows that the high risk associated with lifting the coolant buckets has been completely eliminated. The machine operators are happy to have been a part of the solution and truly appreciate not having to handle heavy unwieldy five gallon coolant buckets.

Booth #: **624**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions)**
Title of Entry: **Motions to the Horizon**
Location: **Albuquerque- Ethicon**
Albuquerque, NM

Presentation Description: A corporate strategy to build customer loyalty and improve the overall purchasing process was implemented in the Customer Support Department. It was a new multi-configuration hand built carton assembly and fill process.

This process created numerous problems and ergonomic concerns right from the start. The team was challenged with creating specific engineered solutions at very low cost for each process where ergonomic risk or improved efficiency was required.

After videotaping and ergonomic review an action plan was created that would successfully decrease the motions used to perform tasks, reduce ergonomic risks, improve work heights and still meet the production needs of the new process.

Problem: Ergonomic risks experienced by associates included: Manually using their bodies to break and assemble large corrugate shippers, multiple hand and wrist movements, pinches, grasps, and reaches during the assembly and fill process, and bending and stooping during final loading. Even early in the process, the ergonomic issues were leading to increased complaints of discomfort and modifications to make the flow and process better.

The solution required the ability to engineer a fix that would address:

- Bariatric kits – 11 different codes and configurations
- Thoracic kits – 3 different codes and configurations
- Colorectal kits – 4 different codes and configurations
- General Laparoscopic Cholecystectomy – 4 different codes and configurations
- General Laparoscopic Appendectomy – 3 different codes and configurations

Due to the volumes and many different configurations that needed to be shipped to the customer, automation was not an option. The shippers used for these products are large (42”x 36” and have a burst rating of 450 psi) and difficult to break open causing individuals to use their bodies as tools to assemble. Quality requirements created additional reaching components in the fill workstation and pack out heights were causing significant bending and stooping. The tray configurations required folding, pinching, grasping, and awkward shoulder positions. Workstation flow was slow and inefficient. Even peeling the shipping labels was a difficult task and took significant time and pinches to complete.

The issues driving the high ergonomic risk score included:

- Size of corrugate shipper that was required to open and seal.
- Ability to have a team assembles 25 unique configurations of cartons and fills. Adding to the complexity of assembly there are 7 trays, 4 cartons, 3 shippers, and 2 dividers.
- Early complaints of potential hand and wrist issues.
- Early complaints of frustration, stress, and headaches based on posture and work flow.

- Inability to automate due to frequency of changes in batch configuration and quantities per run.

Based on configuration of the trays, and dividers each unit is hand assembled, filled and packed.

Efficiency was poor, yet the goal was to be able to produce 60,000 units. Each one different. Each one hand built.

Solution: To resolve the ergonomic concerns many inexpensive improvements/ enhancements were developed to decrease time, discomfort and improve the process including:

- Tray Fixture
- Divider Fixture
- Carton Fixture
- Tab/Flap Fixture
- Shipper Erector
- Labeling Peeling
- Mobile Carts with computer by recycling mobile equipment cart with modifications
- Bin racks
- Picking Rack modification
- Shipper Height Adjustability by modification and dual use of lifting unit

1.The most critical to reduction of ergonomic concerns was a shipper assembly fixture designed, built, and implemented to break open flat pack shippers and properly align shipper flaps for taping.
2.Five unique workstation fixtures were designed, created, and implemented for folding and assembling the many configurations of trays, cartons, and dividers.
3.Parts stands and bins were designed and added to hold product and improve quality.
4.Repurposing of mobile carts and dual purposing lifts were used to improve mobility, quality checks, and height adjustability for associates.
5.Redesign of labels used so peeling and application was made easier.

Measureable Outcomes:

- Shipper erecting ergonomic risk reduction: EJA Risk Score dropped from 56 to 15: High to Low
- Tray building ergonomic risk reduction: EJA Risk Score dropped from 48 to 24: High to Moderate
- Pack out ergonomic risk reduction: EJA Risk Score dropped from 43 to 19: High to Low
- Divider Building ergonomic risk reduction: EJA Risk Score dropped 41 to 19: High to Low

Reduction in manual and forceful opening of flat pack shippers
Reduction in fumbling, refolding and double handling of cartons by using fixtures
Reduction in wrist and finger strain using fixtures to hold cartons
Redesign of labels decreased finger pinches, frustration, and time.

Environmental Impact:
Repurpose of mobile equipment cart for quality inspection
Reuse of lift cart to bring shippers to safe level. Platform and back plate were added.

Cost of Implementation: $6,500

Cost Savings: Hard dollars: Efficiency gains
Since implementation no first aid or discomfort reports
Carton building and handling impacts up to 12 associates in the customer support department.
Before and After evaluation of time requirements and ergonomic risk are:
Savings by Kit Examples
Kit 1 includes – 3 trays, 1 Carton, 1 Shipper
•Single Tray + Divider Tray + Dividers + Large Carton - $76,072 labor cost savings

Cost of materials and Labor - $6500

Return on Investment –	Year 1	
Return on Investment	$	$69,532.00
Return on Investment %	1069.72%	

Booth #: **625**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions)**
Title of Entry: **"Dog Bone" Tool**
Location: **Depuy Synthes**
Horseheads, NY

Presentation Description: DePuy Synthes Elmira manufactures a CMF Low Profile Neuro System that is used in various traumas of the midface and craniofacial skeleton; craniofacial surgery; reconstructive procedures and selective orthognathic surgery of the maxilla and chin. One of

these products is a Titanium Low Profile Neuro Straight Plate that we call a “Dog Bone”. When producing “Dog Bones” the machine process leaves a small sharp tab (approximately 1/8”) that has to be removed using a buffing wheel.

Problem: The “Dog Bones” vary in size from 9mm in length to 15.75mm and 3.75mm width to 6m with thickness of .4mm to .5mm. The manual process of buffing these parts involves using pinch grip when holding on to the pieces and involved movement of the wrist (radial/ulnar movement). This process is repetitive in nature as this is a manual process. On an annual basis we produce 71,632 pieces that works out to approximately 300 pieces daily.

Solution: We designed and manufactured a tool where we can load up to 50 parts to be buffed at one time. One of our machine operators worked with an engineering technician to come up with a design. This was completed by using a combination of our 3D printer and stainless steel used in our tool room.

Measureable Outcomes: The measurable outcome of this tool has eliminated the pinch grip and has significantly reduced the time that the operator has to complete the manual buffing process. Prior to using the tool, it took 45 minutes to do 150 pieces. Upon implementation of the tool, this process now takes 5 minutes. Our machine operators state that it is easy to use, comfortable and saves on movement of their wrists and fingers along with the time savings.

The time savings equates to $6367.28 dollars annually. Plus potential injury savings: Average OSHA Recordable injury is 7K or average Lost Work Day case is 35K.

Booth #: **626**
Category: **Workplace Solutions I (Team-Driven Workplace Solutions)**
Title of Entry: **IR Oven Linear Actuator Ergonomic Improvement**
Location: **Honda Manufacturing of Alabama**
Lincoln, AL

Presentation Description: The Paint Department’s Final Repair associates utilize portable infrared ovens to cure paints applied during repair, and have to manually adjust the height and distance of the ovens by moving a gas spring. This requires force exertions up to 85 pounds and reaches up to 80 inches. By replacing the gas spring with a device that is actuated with a push of a button, the associates were able to eliminate these high force and extreme postural concerns. Quality of the paint repair also improved with a more consistent positioning of the oven. The time to complete the repair process was also reduced.

Problem: Associates performing final repairs in the Paint Department have to utilize portable infrared (IR) ovens to cure the paint that has been applied over the areas of the vehicles needing paint repair. They position these IR ovens by manually pushing and pulling against an arm on the fixture that has a gas spring mechanism to hold the IR oven in the proper place. With larger vehicles typically being produced at this plant, associates may have to position these ovens as

high as 76 inches. Hence, associates will have to reach up to pull or push on this gas spring arm up to about 80 inches high. Additionally, with the IR oven weighing over 100 pounds, the manual force exertions on this gas spring arm ranges from 57 to 85 pounds. These poor ergonomic conditions of extreme postures and high force exertions have already resulted in at least two (2) OSHA recordable cases in the past. If the associate is not able to put this IR oven in the correct position during the first try, additional reaches and force exertions are needed until the IR ovens are adjusted in the correct position. Otherwise, the paint curing process will take longer, or worse, will still not yield the necessary paint finish quality expected of Honda vehicles.

Solution: Realizing that the high vertical reaches and the heavy force exertions resulted in ergonomic concerns, the project team focused on the gas spring mechanism, and developed a simple and inexpensive solution. The team decided to replace the gas spring mechanism with a linear actuator with a remote control button. This allows a full range of motion for the proper positioning of the IR ovens by the area of the vehicle needing paint repair. The cost for this linear actuator and remote control system is a little over $1,000 per oven, needing just about an hour to retrofit this IR oven fixture. By applying this solution for the 16 IR ovens in the paint final repair area, the total cost ended up being a little over $16,000.

Measureable Outcomes: By using the linear actuator system operated by a remote control button, associates eliminated the need to reach up to 80 inches and exert forces up to 85 pounds to position the IR ovens in the correct place. This eliminates the potential for future ergonomics-related injuries to perform these IR oven adjustments. The quality of the paint repair is also enhanced with the more consistent positioning of the IR oven to where it needs to properly cure the paint. The time to complete the paint final repair process has also been reduced, since associates do not have to keep tugging on the gas spring arm several times to place the IR oven in the proper position. There has been 100% positive feedback from all the associates who perform this paint final repair process. With the total cost of about $16,000 and a potential benefit of about $66,000 (injury cost avoidance, quality and productivity cost savings), the project payback period is 3 months. This solution has been implemented at both production lines at Honda's automobile plant in Alabama. The idea has also been shared with other Honda plants across North American.

Additionally, the vendor for the IR oven also requested information about the project team's modification.

Booth #: **705**
Category: **Workplace Solutions II (Engineering/Ergonomist-Driven Workplace Solutions with internal competitions**
Title of Entry: **The Pneu Solution**
Location: **Cummins Inc. - Jamestown Engine Plant**
Lakewood, NY

Presentation Description: This submission includes two new solutions from the inventor of the Ergo Cup-winning "Knight Knuckle" Kendrick Knight. These solutions were built in-house and involve very innovative use of pneumatic actuators to solve some very manual-force specific tasks.

Problem: The problem with the two jobs that these two solutions mitigate is related to the application of force when installing an oil suction tube on a 15 liter engine and installing the accessory belt on the front of a 15 liter engine.

The suction tube installation required up to 200 pounds of force from the operator (pushing while leaning into it) to get it to seat into the engine. This level of force had to be exerted every cycle (approximately every 1.5 minutes).

The installation of the accessory belt required the operator to take a wrench and torque the belt tensioner with 75 pounds of force in a sustained manner while installing the belt with the opposite hand.

Both of these jobs were physically demanding on the operator and were unfortunately the source of injuries.

Solution: These innovative, in-house solutions involve using pneumatic actuators and intelligent design to facilitate the installation of the oil suction tube and the automatic adjustment of the belt tensioner.

The oil suction tube risk has been completely eliminated through a fixture that uses an actuator with a custom made fixture to successfully seat the oil suction tube into the side of the engine, completely eliminating the need for the operator to exert any force.

The pneumatic belt tensioner tool hangs on a tool balancer and safely adjusts the tensioner so that the operator can use two hands to install the accessory belt, completely eliminating the risk.

Measureable Outcomes: Both of these solutions resulted in the complete elimination of the force required to install the suction tube and the accessory belt.

The ergonomic risk analyses had an 86% and 90% reduction respectively. In addition, there was an attractive ROI associated with cost avoidance, productivity/efficiency gains, and quality improvements. In total, the overall financial benefits totaled nearly $500k on a less than $5k investment.

Booth #: **707**
Category: **Workplace Solutions II (Engineering/Ergonomist-Driven Workplace Solutions with internal competitions**

Title of Entry: **Bumper Chuter**
Location: **Toyota Motor Manufacturing, TX, Inc.**
San Antonio, TX

Presentation Description: Toyota's Texas truck plant engineers were asked to investigate multiple concerns in the Plastics Shop. Production Team Members (TMs) were reporting multiple WMSD concerns in the Bumper Chuter process, where they have to carry and feed the Bumper Chuter that is composed of electrical and pneumatic components. In normal production, the TM had to lift each bumper and feed the Bumper Chuter that would then set and sort the part. On occasion the trays would get stuck inside the Bumper Chuter causing for an abnormal condition. When the Bumper Chuter would fail or go offline the team members had to manually lift the bumpers and the trays as part of the back-up process. Each bumper tray weighs about 19 lbs.

Problem: A time study showed that TMs frequently had to use a back up process of manually carrying the bumpers and trays because the Bumper Chuter would break down. Each tray weighs about 19 lbs. while the bumper itself weight about 4 lbs. Because of the electrical and pneumatic components of the Bumper Chuter, the break down would require a complete de-energized maintenance (Lock Out Tag Out) that could take last hours to repair. This meant that TMs had to carry more parts for longer periods of time, thus exposing them to even greater exertion.

Solution: Engineers sought to address the problem through engineering controls. Engineering proceeded to design and fabricate a new gravity fed "free energy" Bumper Chuter, which was low-cost and quickly made in-house. This new innovative design used no electrical power and improved production cycle time. In addition, a bumper cart to house the bumper trays was created that could easily be maneuvered into the new gravity fed bumper chuter, thus eliminating all lifting. The decrease in cycle time, change in bumper cart, and change in Bumper Chuter also positively impacted the conveyance Team Members that load and unload the trays to be transported to assembly line.

Measureable Outcomes: Reduced cycle time 10.3 seconds/cycle resulting in annual production savings of $29,979
Cost avoidance of 1 injury/year results in an annual savings of $25,000 (direct + indirect cost)
Cost of solution was $52,000 (cost of materials + labor)
ROI = 24.9%, with a payback period of 196 days

100% Elimination of electrical power and pneumatic components

Booth #: **709**
Category: **Workplace Solutions II (Engineering/Ergonomist-Driven Workplace Solutions with internal competitions**
Title of Entry: **Backlash Back Saver**

Location: **Honda of South Carolina**
Timmonsville, SC

Presentation Description: In the Differential Assembly Department at Honda of South Carolina the backlash process has proven to be labor intensive. It requires an associate to lift a differential assembly weighing 26 lbs. approximately 600 times daily. With part in hand, the associate must rotate at the waist to place the part onto the awaiting secondary fixture, take the backlash reading and return to the awaiting fixture. This process places continuous strain on the upper extremities, upper back and lower lumbar.

Problem: The differential backlash process is a strenuous process requiring a production associate to lift an ATV differential (26 lbs.) from a conveyor to gather backlash data before returning the differential to an awaiting fixture. This process places strain on the associate's extremities and lower back as reaching is required to place the part in the proper lifting location- part has to be lifted straight up to prevent binding. With the part in hand, the associate is required to rotate their torso to place the part on a fixture to be measured. Following the 12-second measurement process, the part has to be reinstalled on to the conveyor fixture to complete the entire process.

Solution: The differential department was in need of a new conveyor. Being the key time to tackle any ergonomic issues within the department, our ergonomics team partnered with the departmental equipment staff and reviewed the process ergonomics ranking matrix. With the backlash process being the major concern, we shifted our focus onto how we could eliminate the strain on the associates in the process during the design phase of the conveyor build. The goal was to determine how we could gather accurate backlash data without requiring the associate to remove the part from the conveyor. Step one was to implement a lift station in the new design to lift the part fixture clear of the conveyor in order to prevent vibration that could cause an inaccurate reading. Step two was to automate the lift station to the conveyor so that as the part fixture arrived into the correct location, the lift was activated and the part was lifted clear of the conveyor. While the lift station was a part of the conveyor, we were measuring minor vibration. As a result, we had to implement a dampening system that eliminated any remaining vibration.

Measureable Outcomes: Safety- The implementation on a fixture lift station during the design phase of the conveyor build completely reduced the ergonomic stressors and strains on the associate in the backlash process. Currently there is no manual lifting involved in the process

Quality – By implementing the lift station and rotating the PDCA cycle, we have been able to collect data that is both more accurate and more reliable than the data collected in the previous process method.

Delivery- By implementing lean manufacturing characteristics, the total assembly time required was reduced by 12 seconds. This improves daily production volume in the assembly department.

Costs- By involving the ergonomics team during the design phase of the conveyor build, we were able to implement the station with only a $6,200 cost-up from the original conveyor design. With process time savings and the elimination of a 4 hr. rotation associate, this new conveyor style saves the company $73,568 annually in rotation associate reduction and elimination of a possible ergo related loss time injury.

Morale - Happy associates build the best ATV's on earth at Honda of South Carolina. Our team designed and followed the countermeasure through implementation. There is no greater reward than taking ownership in the company for which you work.

Booth #: **711**
Category: **Workplace Solutions II (Engineering/Ergonomist-Driven Workplace Solutions with internal competitions**
Title of Entry: **Revolution!**
Location: **Honda of America Mfg., Inc.**
Marysville, OH

Presentation Description: Due to precision craftsmanship required to build the Acura NSX, manufacturing technicians in the Paint department manually apply over 100 meters of dust sealer. They also apply underbody coating, sound-deadening, and floor panels throughout the body of this high-end vehicle. With traditional fixed-height dollies, technicians would have to bend their torsos over 45 degrees and reach forward over 700 mm for over 2 hours at a time. The team designed a unique rotisserie-style fixture that allows technicians to adjust the orientation of the vehicle body (height and angle) at the most ergonomically-friendly position to perform these tasks. This also improves the quality and time to complete the work.

Problem: At Honda's Performance Manufacturing Center, manufacturing technicians use precision craftsmanship to build the high-end Acura NSX super sports vehicle model. Hence, these technicians manually build the vehicles by hand instead of using automation and mechanized equipment typically utilized in manufacturing facilities that build mass-produced vehicle models. In the Paint Department, technicians have to manually apply over 100 meters of dust sealer, underbody coating, melt sheets and carbon fiber floor panels instead of relying on robots that apply similar components at Honda's other manufacturing plants. Technicians would have to bend over 45 degrees and reach forward over 700 mm for upwards of 2 hours to complete these tasks. These awkward postures add to the process cycle time and could lead to inconsistencies in the quality of work, especially as technicians start to fatigue from the prolonged exposure to awkward postures.

Solution: The project team first set up targets to eliminate any poor ergonomics conditions, particularly with torso bending over 45 degrees and forward reaches over 584 mm (23 inches), as well as to make sure that the vehicle dollies would allow the technician to adjust the unit to his or her preferred orientation (height and angle). Through a series of Y-Gaya (informal and open discussion) meetings and taking voice-of-the-floor (input from the manufacturing

technicians), the project team decided to design a “rotisserie” that allows the technician to position the vehicle body such that they have easy and clear access to the various areas where they need to apply dust sealer, underbody coating, melt sheets and floor panels. While off-the-shelf vehicle carriers were available, these were quite expensive and did not meet the final specification set forth by the engineering team for both process and ergonomics. During each trial build over the next four-month period, the project team continued to modify the design and specifications to accommodate both the process needs to meet production requirements and the ergonomics needs of the technicians. After another three months of fabrication, the rotisserie was finally ready for use. The project team trained the technicians the proper sequence for operating the rotisserie, from loading of the vehicle body by rolling the E-coated car body on the fixture and securing it at four locations, to operating a pendant control to make the necessary adjustments. The final rotisserie includes a 6-foot stroke for the height adjustment and a full 360 degrees for rotation. The total cost for this rotisserie is $32,500. This unique design is patent pending.

Measureable Outcomes: Safety- Improved working posture, eliminating the extended reaches and long duration of poor back posture.
Quality – Improved application of sealer, underbody coating, melt sheets, and floor panels .
Delivery- Rotisserie benefits three different process stages at PMC
Cost – Reduced cost due to injury avoidance.
Morale- Associates are pleased with this improvement. They are able to adjust the equipment to their preferences (height and angle) allowing them to work in a comfortable position.

The rotisserie fixture eliminated all the ergonomics concerns associated with the manufacturing technicians having to manually apply dust sealer, underbody coating, melt sheets and floor panels. The technicians are now able to stand in an upright posture to performs these tasks. Having eliminated the potential poor postures and excessive reaches, the technicians tend to be more consistent with their application of the dust sealer, not to mention taking less time to complete these tasks. Potential cost avoidance from injury elimination and cost savings from quality and productivity enhancement is at least $16,000, resulting in a payback period of 2 years or less.

Additionally, the project team has been able to apply this rotisserie fixture at three different process areas not only in the Paint Department, but also one process area in the Assembly Department. The rotisserie fixtures at these three process areas benefit at least three technicians at each process area.

Booth #: **713**
Category: **Workplace Solutions II (Engineering/Ergonomist-Driven Workplace Solutions with internal competitions**
Title of Entry: **FAUMAC Ergo Torque Arm**
Location: **Honda of Canada Mfg**
Alliston, Canada

Presentation Description: Honda of Canada associates created a free-floating lift assist arm mounted on a wheeled base and positioned it under the CBU to tighten fasteners overhead beneath the car. This solution supports the weight of the tools previously held by hand(9.2lbs each), absorbs the reactionary forces which placed strain on the wrists, arms, shoulders, back(98Nm and 105 Nm torque specifications) and eliminated awkward shoulder postures. This solution provides flexibility for easy relocation of the assist arm to accommodate process modifications. Positive feedback from workers identifies a significant improvement in associate morale. DC Injury avoidance = 6/year; ROI=4.52; Payback in 9 weeks.

Problem: Workers voiced concerns with the weight of the DC tools and the tool "kick-back" forces at Engine Cover process. Lifting and utilizing these DC tools requires two-handed support: One hand to trigger and the other to guide, place and support the head of the tool onto the fastener. The following ergonomic risk factors were identified: - Vertical reach UP distance for the guide hand at 62 inches (RED risk factor according to Honda North American Ergo Guidelines). – Two handed tool weight at 9.2 lbs. (RED risk factor according to Honda N.A. Ergo Guidelines); As the tightening of these fasteners are located in an area where the car bodies is raised and travels overhead, it became strenuous on the person using both DC tools above shoulder height on every car body unit during the tightening sequence. This process has resulted in a rate of 6 injuries per year with an estimated cost impact of $118,000.

Solution: A self-led team of Honda Associates consisting of production supervisors and members of our engineering group, developed a new concept for the production environment that could be introduced wherever DC tools are used. They designed a zero gravity "floating" arm that would 1) virtually eliminate the weight of the two DC tools; and 2) Absorb the reaction forces from the 98 Nm and 105 Nm torque values. This would eliminate the physical impact to the associate's hands/arms/shoulders having to support the weight of both tools and their impact upon completion of each torque. Maximum vertical reach UP distance was reduced from 62 to 50 inches (GREEN risk factor according to Honda N.A. Ergo Guidelines). The mount for the DC tools was designed to pivot as each fastener was positioned at a different angle. The base of the floating arm is on wheels with a guided track to allow the arm to move freely and avoid a pinch point hazard if contact with the above CBU (car body unit) should occur. This has resulted in a 100% elimination of ergonomic risk factors for injury to our associates at the process. A patent application has been submitted.

Measureable Outcomes:
SAFETY: Elimination of risk for hands/wrist/shoulder strain when maneuvering and operating the 2 DC tools. Vertical reach UP distance for support hand reduced from 62 inches to 50 inches (GREEN risk factor according to Honda North American Ergo Guidelines). Force needed to support weight of two DC tools (18.4 lbs.) is negligible. Kick-back force of DC Tool also absorbed by new assist, eliminating "kick-back" force. Posture- holding DC tools can be done with one hand and triggering DC tool results in zero impact force to hand/wrist.

QUALITY: No possible damage to CBU (car body unit). DC tool angles are precisely integrated to avoid accidental release of tool at point of contact avoiding miscommunication of the DC tool sequencing logic.

DELIVERY: 23 seconds of time was saved travelling back and forth between DC tools usage per vehicle. Total savings in Delivery=$

MORALE: Increased 95% - based on response received from associates performing the Engine Cover process. Overtime support tracking shows increase in Associates volunteering to support overtime at these processes due to reduction in musculoskeletal disorder risk factors.

COST: Cost of project input: One (1) FAUMAC Ergo Arm = $22,000
Annual Honda DC tool repairs (i.e. two (2) replacement guns, cables, etc.) = $3500.
Injury avoidance cost savings = $118,000/year.

DELIVERY: 23 seconds saved each cycle = 40 cents per unit.
Total Cost Savings of $ 198,000/year
Return on Investment (ROI)=6.76, Payback = 4.3 weeks.

Booth #: **715**
Category: **Workplace Solutions II (Engineering/Ergonomist-Driven Workplace Solutions with internal competitions**
Title of Entry: **Enhanced Launcher Electronics System RECAP Enhanced Tooling**
Location: **Lockheed Martin Missiles and Fire Control**
Grand Prairie, TX

Presentation Description: Integrated detachable powered lift and "rotisserie" portable fixture was designed, prototyped, built and introduced into the RECAP process of the Enhanced Launcher Electronics System (ELES) to eliminate identified manual handling (lifting, flipping, pushing/pulling) at various stages throughout the process. Incorporation of the fixture also significantly reduced awkward postures which were previously necessary to access hard-to-reach components and locations within the ELES chassis and numerous crane lifts (and associated risk) which were previously required.

Problem: ELES RECAP is the process of refurbishing Enhanced Launcher Electronics System field return units. The ELES chassis contains several heavy and delicate electronic enclosures. The entire ELES unit must be stripped down to the bare chassis, and rebuilt. As the rebuilding process progresses, the weight of the ELES unit progresses increasingly until it reaches a weight in excess of 1300 lbs.

As part of the RECAP process, the ELES units must be handled (lifting, flipping, pushing/pulling, etc.) and manipulated frequently. The handling of these large and heavy parts were previously

done manually and with overhead cranes. In some cases two-man lift was the only approach available.

Throughout the RECAP process, saw horses were used as stationary work surfaces which held the ELES unit as it was rebuilt and repopulated. Inability to position the unit for optimal access led to very awkward sustained positions for workers while drilling, sanding, painting and populating.
In addition, the process required 29 overhead crane lifts, introducing the associated risk.

Solution: Integrated detachable powered lift and "rotisserie" portable fixture was designed, prototyped, built and introduced into the ELES RECAP process. Multifunctional team reviewed the RECAP process, identified several opportunities for ergonomic improvement and developed a rough concept for process improvement. Tooling engineer developed 2D and 3D CAD models for review and revision. Once 3D CAD models were approved, 3D printed prototypes were created to share design idea with the technicians in physical space. Design was optimized based on technician feedback of the functional 3D printed models, and safety features such as the inverted lock pins were added.

Tools were fabricated and usage instructions created, along with training requirements in development for safe operation of the fixtures. Fixtures were trialed and validated using Engineering Use Only hardware before being delivered to employees for integration into production.

New integrated tooling consists of a two-part portable and detachable fixture. The inner tooling of the fixture consist of an air-powered lift cart affixed to a fabricated pallet on casters, capable of raising and lowering the ELES unit, always allowing for it to be placed at optimal working height without any manual lifting. The outer tooling of the fixture consists of a fabricated "rotisserie" on casters, providing the ability to rotate the unit 360 degrees to achieve optimal accessibility without any manual handling of the unit. An off-the-shelf motorized tug was also incorporated into the process to facilitate easy moving of the loaded fixture.

Measureable Outcomes:

- 360 degree positioning on both the lift cart and rotisserie cart reduced part move/positioning time by 84% (from 32 hrs. to 5 hrs. per unit).
- Overhead crane lifts reduced from 29 to 2.
- Total time to turn around an ELES unit through the RECAP process was reduced by 9%.
- Part damage risk significantly reduced by eliminating saw horses and reducing overhead lifts.
- Pinch point, hand and back injury risk significantly reduced.

Booth #: 717

Category: **Workplace Solutions II (Engineering/Ergonomist-Driven Workplace Solutions with internal competitions**
Title of Entry: **Towed Array 3D Hose Grinding Solution**
Location: **Lockheed Martin Rotary Mission Systems**
Syracuse, NY

Presentation Description: New tooling was designed, 3D printed and implemented to enhance the grinding process of towed array hoses, improving efficiency, accuracy and repeatability, while significantly reducing material waste and injury risk associated with sustained manual forces, awkward postures, repetitive motions and lacerations.
Problem: Towed Array hoses must have a dimensional profile created on the inside and outside at each end, which was done manually with a hand held grinder. The operator performing this repetitive grinding process started to complain of back and forearm pain attributed to the force required to manipulate and steady the hose and tooling while working. An ergonomic evaluation was conduct and the following issues were identified:

- Operator was required to "hunch over" the worktable, with awkward sustained postures of the upper back, neck, shoulders and wrist throughout the performance of this task.
- Process required the operator to hold the hose steady and tight, while twisting the wrist to rotate the material during grinding.
- Operator's hand was exposed near the unguarded grinding bit throughout the operation, introducing the opportunity for contact and laceration.

Due to a significant increase in product demand, there was a need to add a second person under this high-risk and inefficient process to meet production requirements, further increasing the likelihood of occurrence of injury.

Solution: New tooling was designed and engineered to square the grind and hold critical dimensions, using a combination of commercial off the shelf (COTS) parts and custom 3D printed designs. Custom squaring attachments, hose center rings and hose mandrills were designed in-house and 3D printed, then retrofitted to a commercial Dremel® tool fitted with interchangeable grinding bits.

Measureable Outcomes:

- Sustained awkward postures, high forces, repetitive motions and laceration risk were eliminated as the new design guards the operator's hand from the grinding bit while squaring the hose to the tool so that there is no need to forcefully hold or twist the hose.
- Robust tooling and significantly decreased changeover time presented a 75% time reduction (from 11 hours to 2.5 hours per unit) associated with the hose grinding operation, yielding a projected cost avoidance of $380,000 over the contract life and providing needed support for the tremendous increase of production rate.
- New design provides consistent and repeatable dimension control, yielding an additional projected annual $70,000 cost avoidance due to scrap material reduction while enhancing process quality.

- Payback Period = 1 day

Booth #: **719**
Category: **Workplace Solutions II (Engineering/Ergonomist-Driven Workplace Solutions with internal competitions**
Title of Entry: **Screw Rethreading Project**
Location: **Raytheon Dine' Facility**
Farmington, NM

Presentation Description: Hardware units program had to rethread (Chase) 72,000 screw holes in an aluminum part by hand work. A thread tap was designed and machined that is inserted into the threaded hole, shank first and rotated counter-clock wise thru the hole via a slow speed, low torque drill . A vacuum hose adopter was designed and fabricated utilizing 3D technology to control metal shavings. The results was a reduction in the Moor-Garg Strain Index from 72 to 3 and a 90% reduction in cycle time per unit.

Problem: The Diné program had to rework 3,600 subassemblies, due to an issued with the threaded screw holes in the unit. Each subassembly has 12 threaded holes that needed to be chased (to cut a screw thread). Extreme caution has to be taken to eliminate foreign metal shavings from entering the finished assembly and from damaging the current threaded holes. All of this work had to be perform within the small opening of the unit. It was determined that this operation had to be done manually. This process involved re-cutting the 72,000 holes using a conventional hand-held threaded tap and tap holder. The operator had to chase the 72,000 holes in the aluminum body utilizing their hand strength. This process took about one hour to complete per assembly. Operators complained of sore hands/ wrist after completing a few holes. The BEFORE score for this screw chasing was Moore-Garg Strain Index of: 72 (RED).

Solution: A cross functioning team was assembled including Program Deputy Chief Engineer, Operations Machine Shop Manager , Diné program manager, manufacturing engineer, EHSS and operators to develop a solution to this ergonomic concern. Several powered drills, tap holders and techniques were recommended and tested. A thread machining tap was designed and machined that is inserted into the threaded hole, shank first and rotated counter-clock wise thru the hole. A small slow speed, low torque, battery powered drill is utilized to complete the task. This configuration meet all of the program requirements and greatly reduces the hand/ wrist stress and is simple and easy for operators to use.

Measureable Outcomes:

- The Screw Rethreading Project has Moore-Garg Strain Index of: 3 (Green)
- Production rate decreased to 10 minutes per assembly.
- Return on Investment (ROI)
    - Tooling Cost: $511
    - Labor/ Injury Avoidance $112,618
    - Cost Avoidance: $112,107

Booth #: **721**
Category: **Workplace Solutions II (Engineering/Ergonomist-Driven Workplace Solutions with internal competitions**
Title of Entry: **Raytheon Test Lift Elimination**
Location: **Raytheon Missile Systems**
Tucson, AZ

Presentation Description: The previous test methodology was physically demanding, requiring multiple lifts for each unit of hardware. It presented safety and quality risks to the hardware. New test stations were introduced that had designed out the need for lifting and manual manipulation for proper alignment. This brought about improved safety for the worker and hardware, increased test yields, and reduced test time. These improvements resulted in labor savings and cost reductions.
Problem: The hardware is assembled in a cradle that protects and hold the unit during the build process, it also protects the unit while it is being transported between operations by a rollerball conveyor line.

After assembly the unit goes to test, where it must be removed by hand from the protective cradle and inserted into the test equipment.

This caused several problems including:

- Stress and strain on the operator. The units at this stage weigh between 14 and 27 pounds (depending on the variant) and must be lifted to a height of at least 50 inches to insert and then again to extract the unit from the test equipment.
- Scratching of the product due to the manual insertion into the test station costs an estimated $ 18,000 per week in extra labor and material.
- Operators spent an estimated 700 hours per year loading and unloading the equipment.

Solution: In order to address the problems with this testing process a new piece of test equipment was designed. This new equipment interfaces directly with the assembly cradles and conveyor, eliminating the need for the unit to be lifted. The cradle with the product inside slides directly onto the test equipment, is aligned and tested in the cradle, and then slides back onto the assembly line. This design also eliminates nearly all opportunities to scratch the unit resulting in significant savings. The design accomplishes this by using a simple rolling platform. The unit inside the cradle slides onto the platform and locks into place. The operator then rolls the platform forward to engage the unit with the test equipment. The rolling system ensures the unit is aligned to the test equipment by the simple act of rolling it forward, no longer requiring maneuvering of the hardware, eliminating scratches. This design is the result of multiple design iterations and concepts. Engineering worked closely with the operations team to vet all the concepts. Multiple proof of concept and prototype tables were built and tested by operators and feedback was given real time.

Measureable Outcomes: Improvements from this project can be seen in regards to safety, quality, and efficiency.

- Safety - 84,000 lifts eliminated annually.
- Revised NIOSH Lifting Index 1.96 (Elevated) with old way of lifting
- Revised NIOSH Lifting Index (Low) with new way of rolling (no lift)
- Quality - reduction of test failures due to improper alignment and scratches from trying to align hardware in station and opportunities for dropped hardware.
- Efficiency (cost) - reduced time for operator to lift unit, align, and remove unit
- Delivery - The new system will help improve factory efficiency and allow for unprecedented factory output and delivery to customers.
- The overall annual savings from this improvement is $953K.

Booth #: **723**
Category: **Workplace Solutions II (Engineering/Ergonomist-Driven Workplace Solutions with internal competitions**
Title of Entry: **3-2-1 Clamp and Pull**
Location: **The Timken Company - Bearing Inspection, Inc.**
Los Alamitos, CA

Presentation Description: At our Los Alamitos, CA facility, aerospace bearings used in multiple different turbine engines are rebuilt per stringent regulation provided by the FAA, our customers and internal proprietary instruction. A new bearing of this type can cost between $15,000 and $30,000 while a refurbished one can cost between $6,000 and $10,000. The labor intensive process of disassembling these bearings cause repetitive, awkward postures with high forces. Associates complained of discomfort in the wrists, elbows, shoulders and neck. A quantitative ergonomic risk assessment validated the discomfort and warranted a new process. The Los Alamitos team developed a simple, innovative tool that consolidated the two difficult tasks of destaking and roller extraction into one piece of equipment that eliminated the ergonomic and safety risk while reducing cycle time and improving quality.

Problem: The destaking and roller extraction process is used during our bearing rebuild process. It is critical to extract the rollers from the bearing without damaging the cage. This was a two-step process. First we had to destake the retention tab features using a hand press requiring 50 to 80 lbs. force which is above our design guidelines of less than 30 lb. recommended and 42 lb. max. In the second phase of the process, each individual roller in the bearing was clamped in a vice fixture. A leather headed mallet was used to strike the vice handle 2-3 times to tighten the fixture onto the roller, then the outside ring of the bearing was struck 2-3 times to extract the roller from the cage, and finally the vice handle was struck 2-3 times to loosen the vice fixture to remove the roller. This process was repeated up to 42 times to remove 42 rollers per bearing. The associate may perform this process up to 6 bearings per day. Our associates were experiencing pain and discomfort in the wrists, elbows, shoulder, neck and back while removing the rollers. This process exposed 3 qualified associates on any given time or day and equates to

32,620 opportunities per year to experience a musculoskeletal injury from manually removing the rollers.

Solution: The plant Engineering Manager and Senior Design Engineer worked together to design a tool that consolidated the two completely separate operations of destaking and roller extraction into one piece of equipment. The operator activates the roller clamp with his right hand with 5-9 lbf. With the roller clamped in a stationary position, the operator then grasps the slide table activation lever with his left hand which then destakes and extracts the roller with 3-6 lbf.

Measureable Outcomes: Innovation: This was an invention developed in-house that made two difficult tasks consolidated into one easy and safer task for our associates while reducing the cycle time by 65%. The device worked so well, two units were made and can be used on over 95% of the product line.
Simplicity: This tool achieves perfect results with minimal moving parts and components. The new piece of equipment utilizes simple levers, slides and serrated carbide steel anvils (previously smooth) to minimize destaking and clamping forces. Additionally, the hydraulic roller clamping system was dropped from the original design in lieu of a simple mechanical clamping configuration.

Cost Saving: The initial tooling cost $5000.00 to build. A second set was built for a total of $10,000. Consolidating the two steps of destaking and roller removal into one piece of equipment has produced $23,000 in labor savings per year and injury cost avoidance of at least one MSD (average cost $7,500). Based on labor savings, productivity gain and preventing one MSD, payback = 3.9 months (116 days). Projected ROI = 210%. Conservative ROI = 136%

Ergonomic risk reduction: This new tooling virtually eliminated the ergonomic risks of destaking the retention tabs and removing the rollers. We reduced the ergonomic job hazard score by 94% (25.6 to 1.6). The force required from the original destaking press went from 50-80 lbs. to 3-9 lbs. Our solution reduces the stress placed on the neck, back, shoulders, elbows, forearms, wrists, and hands. The improvement has had great feedback from the operators and has eliminated thousands of unsafe motions and forceful exertions per year.

Other Improvements: Quality - the new tooling minimizes the movement of the roller retention feature making damage to the existing cage less likely. Recovery of the used cage reduces the rebuild cost.

Booth #: **725**
Category: **Workplace Solutions II (Engineering/Ergonomist-Driven Workplace Solutions with internal competitions**
Title of Entry: **Spider Holding Fixture**
Location: **Gulfstream Aerospace**
Mexicali, Mexico

Presentation Description: Detailing process for Majors assemblies is not ergonomic due to the size and complexity of the parts. This compromise the safety of the employees.

Assembly weight is over 80 pounds, it cannot be manipulated, so the employee needed to adapt himself to the process.

Problem:

- Difficulty to reach upper parts:
- Pain in arms and neck due to the position on the leader (3 hours process).
- Difficulty to work on the lower areas:
- Back bend for more than 4 hours

Solution: Industrial Engineering design for a Holding Fixture that meets Ergonomics and manufacturing process.

Design was made in coordination with: Operations staff, manufacturing engineers, IE and Safety specialist.

Measureable Outcomes: Etools analysis: Risk reduction of 152 Pts.
Before implementation: Total Risk Score 248
After implementation: Total Risk Score 96

2.34Hrs process improvement x 58 AC (G650)
Annual hours reduced = 270Hrs / Lean Saving = $8,237Dlls

Booth #: **627**
Category: **Workplace Solutions II (Engineering/Ergonomist-Driven Workplace Solutions)**
Title of Entry: **The Rack Saver**
Location: **Depuy Synthes**
Horseheads, NY

Presentation Description: The Rack Saver is an Electropolish Part Racking Fixture. The racking fixture is a hanging type metal rack with spring clips that grip the part during the Electropolish Finishing Operation. The operator loads a part into the spring clip on the racking fixture and then moves the rack from the loading station to the Electropolish Machine. The type of spring chips used in "The Rack Saver" fixture have been redesigned to reduce the amount of operator finger pinch grip force from twelve to one pound and has also reduced the load time from 5.0 seconds to 1.4 seconds per part.

Problem: The Electropolish Finishing Operations have been transferred from the Depuy Synthes Monument CO Facility to the Horseheads, NY Finishing Facility for the Wires Product Line. The quantity of product transferred to Horseheads, NY is 1.2 million parts per year. The part rack

fixture that was used in Monument was transferred to Horseheads. The part rack fixture received uses 50 alligator clips to hold the parts. Each alligator clip requires a force of twelve pounds of pinch grip force to open and hold open the clip using one hand while the second hand positions the part into the alligator clip. The force for the second hand to hold and position the part in the alligator clip is one pound of pinch grip force. Once the part is in position, the first hand can release the alligator clip securing the part in the racking fixture. The process is repeated until all of the positions are filled. This procedure is repeated for unloading the racking fixture.

Solution: The Horseheads Finishing Department Engineering Technician began work on designing an improved more Ergonomic friendly part racking fixture. After many trials, the improved part racking fixture design uses preformed wire clips that require only one pound of pinch grip force per hand to load and unload the part. The redesigned racking fixture capacity has been increased from 50 to 200 pieces. The additional capacity per part racking fixture has reduced the number of trips between the rack loading station and the Multifinishing Machine.

Measureable Outcomes: No. of Parts Annually: 1.2 million
Operation Information:
A) Shifts/Day: 3
B) Shift Duration; 480 Minutes
C) Population Affected; 3,
D) Average no. of parts processed per Shift; 1,612

Safety:
A) Old Rack Process: Total Pinch Grip Force exerted per shift; 1,612 pcs * 2 (load & unload) * 12 pounds of pinch grip = 38,688 pounds of pinch grip / shift
B) Improved Rack Process: Total Pinch Grip Force exerted per shift; 1,612 pcs * 2 (load & unload) * 1 pounds of pinch grip = 3,224 pounds of pinch grip / shift
C) Summary: Operator uses 12 times less force per part with “The Rack Saver”

Production Improvement: Time to load; 1) old process = 5 sec/part, 2) Improved process = 1.4 sec/part, 3) Time Improvement is 3.6 sec/part * 1.2 million parts = Labor Reduction of 1,200 hours annually
Cost Savings: $49,000

Quality: No change in the quality of the part

Booth #: **718**
Category: **Workplace Solutions II (Engineering/Ergonomist-Driven Workplace Solutions)**
Title of Entry: **Detonator Potting Upgrades Eliminate Ergonomic Risks and Productivity Issues**
Location: **Los Alamos National Laboratory**
Los Alamos, NM

Presentation Description: Los Alamos Unclassified Release - 'LA-UR-16-28178'
Detonator potting was the rate limiting step and caused ergonomic injuries. The ergonomist, process engineer, and mechanical engineer evaluated the tasks. The problems identified were manipulation of 480 screws daily, hand stirring a thick resin, looking through a microscope, resin inconsistencies, and a 24 hour resin cure rate. The team designed a new fixture, procured a mixer and screened microscopes, and redesigned the potting mold. These changes eliminated the ergonomic hazards and rejection rate, greatly reduced the cure rate to 2 hours, and increased production by three to five folds. The ROI is estimated at 3 million dollars.

Problem: Detonator production requires several steps, one step being potting. The potting task has been performed in the same matter for over 40 years with minimal to no change to the processes. Since production of the detonators is strictly regulated, changes to the processes are often difficult and must be thoroughly reviewed by the design agency. Although altering the process would be challenging, the team determined change was mandatory. The potting process was the bottle neck of production as well as an ergonomic injury risk.

The ergonomist did a thorough walk down of each task as well as reviewed a 10 year history of injury data. Potting was deemed a high ergonomic injury risk. Three particular steps in detonator potting were of concern. First, the mixing of the highly viscous resin by hand was difficult on the shoulder, hand and wrist. The stirring task took approximately 5 minutes per batch. One rotator cuff irritation was traced back to the mixing of the resin. Second, placing the cable assembly in the fixture and clamping/releasing it, required one worker to manipulate 480 screws per day. This caused a Dequervian's injury to a worker. The workers often used a manual T-handle to first loosen the screws, and then manually twisted the screws by hand the rest of the way. This was deemed faster by the work force. The reverse was performed to place the screws in the fixture. This task required fine motor skills with excessive repetition causing wrist, hand, and finger issues. Lastly, each detonator was examined under magnification using a standard microscope. This caused stress on the neck and upper back.

Along with the ergonomist, the process engineer carefully reviewed the various process steps and determined potting was the rate limiting step in production. This manufacturing step required approximately 26 hours per batch, mostly due to the resin cure time. The rejection rate for this process was also noted to be 12%, costing hundreds of thousands of dollars per year. This was caused mainly by the bubbles in the resin and lack of gas escape capability of the potting mold.

The current potting mold (RTV):

- Traps air pockets.
- Air does not have time to escape with new processes.

The mechanical engineer was informed of the ergonomic issues in regards to the fixture. The fixture thermal mass also was causing an increase time for curing due to the oven temperature stability requirement with a large number of fixtures. The fixtures were manually placed on old angled wooden stands for pouring the resin. Each fixture then had to be removed from the stand

and placed in the oven for curing. The mechanical engineer analysis determined the following in regards to the present fixture:

- Not ergo-friendly
- Large thermal mass
- Needs tools to use
- Mold force varies from technician to technician
- Stand for potting cannot go in the oven

Solution: Many improvements to the potting process resolved the curing time issue, reduced the rejection rate, improved ergonomics, and increased production.

- The new fixture utilizes magnets and one spring loaded knob vs. screws for the same function. This eliminated the ergonomic hazard. The lighter and more compact design allows for increase in curing oven capacity because it has 3 times less thermal mass.
- The new microscopes utilizes cameras thus eliminating looking through eyepieces with an awkward head and neck posture
- An automated mixer costing approximately $ 10,000 eliminated the ergonomic risk associated with manual stirring. The mixer also eliminated the inconsistencies in the resin, thus improving quality and avoiding bubbles. This had a substantial impact on the rejection rate.
- The RTV mold was redesigned eliminating the voids. The new molds also reduced cleaning time by one hour. The benefits of the new mold are:
    - Bubbles have escape channels and pockets to be drawn to
    - Machined out of one piece of stainless steel (no bonding means more consistency)
    - The screws insert from the top
    - Reduced cleaning time

Measureable Outcomes: The changes introduced by the engineers and ergonomist eliminated the high risk of injury. There have been no reported injuries since the new process equipment was introduced. Workers state the tasks are a lot easier to perform and they no longer feel fatigue at the end of the day. The productivity rate has increased by 300% to 500% mainly due to the new fixture and improving the cure rate. The time for production was reduced from 26 hours to 2 hours. The rejection rate has been eliminated; zero parts have been rejected. The previous rate was approximately 12%. The investment on new equipment, mixer and microscopes was approximately $75,000. The return on investment is estimated to be 3 million dollars. The design agency stated the detonators being produced are the best quality that has ever been manufactured.

In conclusion:

- Throughput is now 3 - 5 times greater than before
- Superior quality
- No rejects, reworks, or non-conformance reports (NCRs)
- Eliminated ergonomic hazards

- Happier and healthier work force

Booth #: **720**
Category: **Workplace Solutions II (Engineering/Ergonomist-Driven Workplace Solutions)**
Title of Entry: **"HANDLING" Ergonomic Issues**
Location: **GE Appliance a Haier Company**
Louisville, KY

Presentation Description: We will present how a simple HANDLE made a difference. With the work of our ergo leader and in house maintenance we made a shovel like handle that was bent in an upward position. We will show the challenge that existed, we will bring samples of the before fix and after the fix for people to try. We will bring video of how this is actually working on the assembly line so that people can see our pathway to a solution. We will bring still pictures (posters) of the before and after with all the bad postures marked. As well as charts showing the small amount of cost to make this fix, the high cost of the injury, the risk factors, the simplicity and the out come. We will have a poster to show a profile of our facility. We will have all of this printed on a one page summary so people can take this idea back to their jobs with them.

Problem: On a moving assemble line with only 17 seconds to do their jobs the operators had to push in a hose and lock it in place in the bottom corner of a washing machine as well as other duties that required working at the top of the machine. This was a job that required the operator to bend with back flexion, push in a hose that caused wrist extension and some operators even used their knees (causing contact stress) to help lock in the hose. The units could not be raised up and the operators could not be lowered. We had two assembly lines and two shifts running with this problem. That was a total of twelve operators who could get hurt. We started having operators injured, doctor visits, physical therapy, time off work and a high turn over rate on the job. So where do we go from here?

Solution: Operators called for their building ergonomic leader to come look at their problem. The ergo leader and in house maintenance came up with a handle that looked like a bent shovel pointing upward. Operators no longer had to bend to put in their hose, eliminating back flexion. Operators no longer had to push with wrist extension now their wrist was neutral in position. They no longer had to use their knees to lock in the hose eliminating contact stress.

With thirty stations on each line our cost was only $30.00 per station. Parts and labor total was only $1500.00 per assembly line. This was a simple fix that only took two days to make the parts and one day to install.

Measureable Outcomes: The cost of one strain injury is $33,528.00 for direct cost, $36,880.00 for indirect cost totaling $70,408.00 in cost and you must sale $2,346,933.00 in additional product in order to cover the cost. If all 12 operators had been injured additional sales alone would have run $28,163,196.00

The biggest out come was our injury rate went from three injuries in six months to Zero injuries in a year. Safe, happy operators and a decrease in turn over rate.
This shows that a simple fix, with low cost, in a small amount of time can be done in house and make a world of difference. It's all in how you "HANDLE" each situation.

Booth #: **724**
Category: **Workplace Solutions II (Engineering/Ergonomist-Driven Workplace Solutions)**
Title of Entry: **Smart Clean CT (Computed Tomography) Slipring**
Location: **General Electric**
Guang Zhou, China

Presentation Description: The CT gantry serves an essential function in a CT Scanner. The Slipring provides power to the gantry power and enables the transfer of scan data. The slipring works with a brush block, and thus, metallic dusts and carbon dusts begin to stick to the slipring surface after 3 or 4 months. The slipring needs to be cleaned periodically to ensure the CT works well. The frequency of the preventative maintenance cleaning task is 3 times per year. In China, one single CT field engineer maintains about 15 CT machines, which means each field engineer must clean sliprings almost around 45 times per year.

Problem: Field engineers used to wipe a slipring with an eraser and spend ~ 2 hours to clean a dirty slipring. This task had high ergonomic risk factors including pinch grip for around 2 hours/machine, repetition (10,000/machine) and awkward upper extremity postures. This task also created the potential for other safety issues including metal dust inhalation. In addition, the product quality was found to be substandard due to poor human-machine interface.
Ergo evaluation using Rodgers Muscle Fatigue analysis tool indicates high risk on shoulder, upper back, arms and elbows, hands, wrists and wrists. Design for Ergo (DF) postural analysis methods indicated similar results.

Solution: The solution has been evolving for four years. The 4th generation solution includes a custom fixture which is installed on the base of the brush block, eliminating the manual operation. When the gantry turns on, an eraser wipes the slipring automatically. In addition, we can adjust the force on the slipring so to ensure the cleaning met quality expectations. To address the dust problem, a dust collector was installed.

Measureable Outcomes: This solution has reduced or eliminated all Ergo risks above and increased efficiency by 8 times.

- Eliminate Ergo risk: Invented a machine that eliminated manual cleaning.
- Improved efficiency: When machine cleans the slip ring a Field Engineer can work on other tasks.
- Health risk reduction: Dust collector collects all dust from the slipring.
- Total slipring clean time reduction: Reduced from 2 hours to 0.25 hours, Efficiency improved 8 times

- Save material cost: Slip Ring cleaning sponge can use be used multiple times.
- Improve clean quality: The strength of the clean tool results in consistent cleaning.
- Equipment safety: Avoid risk of circuit board short out caused by carbon dust falling on the circuit board.

Booth #: **727**
Category: **Workplace Solutions II (Engineering/Ergonomist-Driven Workplace Solutions)**
Title of Entry: **Lightweight Locating Template**
Location: **Gulfstream Aerospace**
Mexicali, Mexico

Presentation Description: There was a first aid when one mechanic was using this 60lbs. heavy fixture by himself, which causes mechanic's disability for 3 weeks for back pain. First containment action was to tag this fixture to be manipulated for 2 persons. As corrective action it was identified that noted fixture didn't need to be that heavy and that big to secure the position of two angles, so we took material that we have in house and created only the section required for this process ensuring quality of product, people safety and low cost.

Problem: There was a 60 lbs. steel big fixture/template which needed to be handled and placed to bank and locate two angles in Assembly drill jig, tool was manipulated by one person and causes back pain and 3 weeks of disability for the person. Noted fixture needed to be handled by 2 persons when the process required to install those two angles to avoid any injury. e tools system evaluation of 64 risk points.

Solution: A lightweight 9lbs and handy template was created in house from aluminum with only the section required to install those angles, only requires one person to be manipulated.

Measureable Outcomes: 100 risk points eliminated, and there's no need to wait for another person to assist during this process. Lightweight locating template was created in house with scrapped material.