Innovative Ergonomic Solutions in Manufacturing

“Cost effective ergonomic improvements”

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Innovative Ergonomic Solutions in Manufacturing

Ergonomic improvements can produce significant cost effective benefits.

- Injury / Illness Risk Reduction
- Human Error Incidence Reduction
- Increased productivity
Morning “Welcome” Sign
Millions of Holes and Rivets
Propulsion Structures & Systems

Product Overview

Under-Wing Propulsion Package

Nacelle – Fan Cowl

Nacelle - Inlet

Pylon

Nacelle – Thrust Reverser
Propulsion Structures & Systems
Ergonomic Focus

Small Precise Tasks
Large Component Integration
Wellness-Focused Culture

ERGONOMICS
- Employee Based Resolutions
- Preventive Focus
- Lean Principles

SAFETY
- Safety Monitor Leadership
- Teaming Approach
- ASAP Investigation

WELLNESS
- Stretch / Water
- Wellness Fairs
- Healthy Spirit

Safety Costs → Safety Morale
Design to Accommodate Diverse Workforce
Design Team Ergonomic Support

Computer Modeling

5th – 95th % ile
Human Reach
Frugal “Cardboard” Mock-ups

Scaffold Evaluation

Worker Visual and Reach Access
Problem:
Mechanics apply sustained static force to drill motors, high repetition, hard metal, difficult postures.

Solution:
Pneumatic drill assist system air cylinder, shop air, unique push-plate. Replace the 40+ lbs push force applied to drills.

Benefit:
Reduced MSD injury risk factors and improved hole quality. Reduced process time and bit consumption.
Drill Assist System
Aft-Cowl

**Problem:**
Repetitive manual drilling of titanium / aluminum caused static force to wrist and arm.

**Solution:**
Add pneumatic assist to drill, build a radius push-plate.

**Benefit:**
Reduced risk of injury. Reduced drill bit change-out. Improved worker morale.
Hammer / Chisel Weld Smoothing

**Problem:**
Risk Factors include: Shock to upper extremities from hammer striking chisel; Repetitive stress to shoulder from hammer swings; Risk of hammer hitting worker’s hand

**Solution:**
Pneumatic “One Shot” Hammer

**Benefit:**
Reduced risk of injury. Improved worker morale.
Pneumatic Lifting Fixture

Problem:
Back strain risk factors are high when manually lifting 737 nacelle panels out of BAJ during breakout process.

Solution:
Lift / move panels with a vacuum powered end-effector attached to post - jib and air hoist.

Benefit:
Reduced risk factors for back injury and eliminated panel delamination damage.
Scissor Lift Door Cart

**Problem:** Employees suffered back & upper extremity discomfort from leaning over standard cart for extended periods.

**Solutions:** Modify standard door cart by cutting off wheels and attaching to hydraulic scissor lift.

**Benefits:** Reduce potential for injury as a result of deviated posture for extended periods. Improve morale.
Mill Control Monitor Table

Problem:
- Milling process required visual access to two vertically stacked monitors
- Operators developed neck pain (three were visiting chiropractors 2-3 times per week).

Solution:
- Modified existing computer table to recess the monitor base to 10” below work surface.

Benefits:
- Worker’s neck pain subsided
- Need for chiropractor’s neck treatments ended.
Tool Weight Reduction

**Problem:**
Tool component weighed 130 lbs, required overhead crane to lift into position.

**Solution:**
Tool weight reduced by adding post / jib fitted with “zero gravity” balancers.

**Benefits:**
Eliminated two 10 minute crane moves for each part, and safer handling process.
**Problem:**
Manual lifting of tools during assembly process creates fatigue for mechanics.

**Solution:**
Incorporated column and jib to suspend tools using zero-gravity balancer.

**Benefit:**
Tools become more accessible and reduces fatigue from manually lifting tools during assembly process.
Tool Suspension

**Problem:**
Mechanic uses multiple tools. Weight excessive.

**Solutions:**
Install overhead rail sufficient to support each tool.

**Benefits:**
Eliminates the repetitive process of holding tools for extended periods.
Articulating Arm

**Problem:**
Repetitive process that results from using awkward posture while drilling creates ergonomic risk.

**Solution:**
Incorporate articulating arm that suspends vertical drill.

**Benefit:**
Eliminate using awkward posture while drilling. Improve productivity by improving hole quality.
Reasonable Accommodation

Problem: Mechanic with prosthetic arm unable to actuate trigger of drill motor.

Solution: Added foot actuator to process that allows mechanic to activate tool with foot.

Benefit: Improved productivity as a result of improving process.
Tool Access

**Problem:**
Tool configuration required mechanics to stand on a box to perform the assembly process.

**Solution:**
Modify tool to accommodate multiple positions and eliminate mechanics necessity to stand on box and stepper.

**Benefit:**
Increased productivity
Reduce Fatigue from Kneeling

**Problem:**
Kneeling discomfort from working in confined spaces.

**Solution:**
Eliminate sitting and kneeling discomfort with off-the-shelf stool.

**Benefit:**
Better access to assembly and reduced fatigue.
Padding Reduces Fatigue

**Problem:**
Inadequate padding for mechanics in restricted space.

**Solution:**
Provide new pad to reduce contact stress.
Stringer Seat

Problem:
Compression to legs and thighs to employees working inside the cargo area.

Solution:
Provide a seat that mechanics can lean/sit on when working.

Benefit:
Eliminates trauma from extended squatting.
SUMMARY

Cross functional ergonomic improvements, supporting multiple organizations to accomplish:

• Risk reduction

• Increased productivity

• Injury reduction

• Improved morale
Questions