Ergonomics Solutions At Boeing - From The Floor To The Sky

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Coolant switch universal handle

Problem:
- When filling machine with coolant operator was required to hold switch open up to 20 minutes with awkward arm position

Solution:
- Utilize universal handle to turn switch

Benefits:
- New handle allows arm to remain in neutral position when filling machine
Coolant nozzles

Problem:
- Prior nozzle required excessive grip force to activate coolant flow

Solution:
- Install new nozzles with locking trigger and automatic shut-off

Benefits:
- Excessive grip force eliminated along with need to wire open nozzles
Flight controls turntable

Problem:
- Assembly fixture must be rotated frequently when making wire connections
- Friction between fixture and work surface caused strain to assembler when lifting and rotating fixture

Solution:
- Place turntable on work surface to facilitate fixture rotation

Benefits:
- Strain to operator is reduced
Carburetor raw stock lathe lift

Problem:
- Lifting carburetor raw stock from basket required handling of material in basket attach sling
- Handling material in basket created risk factor as push / pull forces were created while bent over

Solution:
- Utilize magnetic lift to move parts from basket onto bench where sling can then be attached

Benefits:
- Handling parts in basket is eliminated
- Back bending is reduced
Problem:
- Workers have to routinely fill machines with coolant and other fluids
- Fill ports are in a position on the machine that requires workers to kneel or bend over for prolonged time periods

Solution:
- Install PVC extension to allow operator to stand or sit when filling tanks

Benefits:
- Reduced risk of knee injury
- Reduced risk of coolant spills
Hand finish lights

Problem:
- Dusty overhead lighting provided inadequate illumination which forced operator to bend back and neck to look for defects in part
- Part pockets did not allow overhead lighting to illuminate area

Solution:
- Install new light bulbs
- Provide specific hand finish areas with cordless task lighting

Benefits:
- Improved lighting reduced back and neck bending to view parts
- Improved lighting reduced re-work as parts were finished with higher quality
Problem:
- Operators must bear the weight of heavy protective equipment while shot peening for up to two hours
- Serious risk of neck and upper back injury

Solution:
- Design a stool that will glide over the floor grates and allow operator to have direct line of site

Benefits:
- Reduce the amount of time operator must have neck at a greater than 45 degree bend
- Improve quality of work
Hand finish pickle fork tilt table / stand

Problem:
- Identified ergonomics risk factors include:
  - Neck flexion
  - Pinch grip with awkward wrist
  - Hand / power grip with awkward wrist
  - Instability of part on saw horse

Solution:
- Tilt Table / Stand apparatus developed and fabricated

Benefits:
- Pickle fork can be positioned at an angle reducing awkward arm / wrist postures
- Posts provide part stability when on saw horses
- Angled position allows for better viewing of part to identify surface flaws
Problem:
- Operator had to lift slug from basket onto equipment with ill-positioned magnetic lift
- Operator had to manually reposition raw stock on Rockwell while standing on step stool

Solution:
- Utilize electric lift to raise raw stock to equipment height
- Lift platform was modified to allow raw stock to be positioned onto Rockwell while on lift

Benefits:
- Manual repositioning of raw stock eliminated
- Magnetic lift can be used on raw stock in correct position
Reduced fixture clamps

Problem:
- Excessive strain was placed on operator when tightening fixture clamps located above shoulder height

Solution:
- Reduce number of clamps required to hold part on fixture

Benefits:
- Excessive strain was reduced
Problem:
- Sealant totes arrive with baskets located near bottom of tote forcing at risk lifting condition

Solution:
- Design, fabricate and install metal rack to provide false bottom which raises height of baskets in tote

Benefits:
- Back bending is reduced when lifting sealant baskets from tote
High friction gloves

Problem:
- Gripping slippery parts requires forceful pinch grips to be used when handling parts
- Thread inspection task required forceful pinch grip

Solution:
- Provide high friction gloves with special coating to increase coefficient of friction between glove and part surface

Benefits:
- Hand and pinch grip force reduced
Problem:
- Mini-cantilever parts arrived in paint shop on flat top carts
- Excessive push / pull force was required to tilt part when connecting it to paint conveyor system

Solution:
- Text tube carts were fabricated which oriented parts in a vertical position

Benefits:
- Vertical position of part facilitates connecting part to paint conveyor system
- Eliminates need to tilt part on cart
Problem:
- Workers have to raise their hands over head when positioning parts to clear the top of the racks.
- Hard hats are a requirement as a result of this task.

Solution:
- Remove the top 16 inches off the rack.

Benefits:
- Allows employees hands to be in their strike zone, giving them better control over loading the part.
- Reduce part damage.
- Remove the hard hat requirement.
Parts basket trip hazard

Problem:
- Workers have to walk through two areas of the parts basket where there is a potential for serious injury from tripping or falling

Solution:
- Install grated floor at the two walk through areas where the wheels are

Benefits:
- Reduced risk of injury from falling or tripping
- Does not affect quality of the process
Outside the shoe padding

Problem:
- Workers must stand in static positions and walk on smooth hard surfaces while working on machines all day

Solution:
- In lieu of matting the entire area, anti-fatigue padding which attaches to the shoe sole was provided

Benefits:
- Reduced lower extremity pain and discomfort
- Reduced risk of repetitive strain injury
Inside the shoe padding

Problem:
- Workers must stand in static positions and walk on smooth hard surfaces while working on machines all day
- Due to constraints, matting and under-the-sole shoe padding cannot be used

Solution:
- Shoe sole inserts which provide anti-fatigue padding was provided

Benefits:
- Reduced lower extremity pain and discomfort
- Reduced risk of repetitive strain injury
Coolant transportation tanks

Problem:
- Heavy metal transfer tanks
- Hard to push and turn
- Slow fill times
- Significant spill risk

Solution:
- Design, prototype, and fabricate new coolant transportation tank

Benefits:
- Lighter weight, easier to push and turn
- New casters reduce rolling friction
- Improved handle design
- Quicker fill times
- Liquid contained to minimize spills
- Signage and color tags identify liquid type

Before

After
Things to think about

- Some of your best ideas come from the people who do the actual work you are trying to fix

- You must include the people who do the work in the solution creation process

- Don’t scoff at any idea – it may lead to the best idea

- Research how other groups are doing similar jobs

- The first fix might not work, be ready to try several fixes