

CASE STUDY - Machining

TASK TITLE: Machining

Task Description:	<p>Machining involves the use of a hydraulic cutting tool (e.g., Computer Numerically Controlled-CNC) to cut/form a shape out of a piece of metal. The employee must load the piece of metal, cycle the machine, and then remove the finished product. Additionally, the employee typically performs a series of test measurements. In some cases, the employee may need to grind the piece after machining is completed.</p> <p>Typical jobs or work areas in which machining is performed include (not necessarily limited to):</p> <ul style="list-style-type: none">• aircraft maintenance• facility maintenance• model shop
Job Performance Measures Most Often Impacted By Machining:	<ul style="list-style-type: none">• Dimensional accuracy of finished product• Speed of task completion
Typical Employee Comments about Machining:	<p>Due to the wide variety of work situations, employees may complain about discomfort or stiffness in any of the following areas: shoulders/neck, hands/wrists/arms, back/torso or legs/feet</p> <p>The primary body parts affected are typically: shoulders/neck, hands/wrists/arms and back/torso</p> <p>The secondary body parts affected are typically: legs/feet</p>
Suggested Level II Analysis:	Grip Force Measurement, Postural Analysis, Dynamic Task Analysis, Light Measurement, Lighting Analysis

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Reaching	• Work location is too far away	38. Move closer to the work location • remove obstructions	✓	✓	med	med	med
		41. Move work piece closer to body • modify fixture		✓	low	med	med
	• Work location or bin is too low	83. Provide an adjustable-height lift table • provide a spring loaded pallet jack to elevate the parts bin			✓	med	med
2. Arm forces: Repeated contraction of the muscles of the arm or holding/ carrying materials	• The work piece is too heavy	61. Provide a mechanical lift device • provide a mechanized method for installing and removing the work piece.		✓	med	med	med
3. High speed, sudden shoulder movements	• Rarely occurs	N/A					

Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
4. Head/neck bent or twisted	<ul style="list-style-type: none"> Finish quality must be visually inspected and measured 	22. Increase light levels <ul style="list-style-type: none"> provide task lighting which is easy to adjust 	✓		med	med	med
		136. Rotate the work piece <ul style="list-style-type: none"> turn the work piece to an upright or tilted position 	✓		low	med	med
		<ul style="list-style-type: none"> provide a fixture to allow the work piece to be rotated 		✓	med	med	med

Hands/Wrist/Arm

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
5. Bent wrists/repeated wrist movements or repeated forearm rotation	<ul style="list-style-type: none"> Inappropriate fixture design 	136. Rotate the work piece <ul style="list-style-type: none"> manually turn the work piece to an upright position provide a fixture to allow the work piece to be rotated 66. Provide a power tool <ul style="list-style-type: none"> replace manual clamps with a hydraulic fixture 	✓	✓	low med high	med med high	med med high
6. Repeated manipulations with fingers	<ul style="list-style-type: none"> Rarely occurs 	N/A					
7. Hyper-extension of finger/thumb or repeated single finger activation	<ul style="list-style-type: none"> Use of tool with single trigger concentrates stress 	62. Provide a multi-finger trigger <ul style="list-style-type: none"> provide a tool with a multi-finger trigger provide electronic caliper to eliminate thumb action 		✓	med high	med med	med med
8. Hand/grip forces	<ul style="list-style-type: none"> Tool or work piece must be manually supported, held or steadied during grading or inspection 	118. Provide support for the work piece <ul style="list-style-type: none"> provide a fixture to support work piece 118. Provide support for the work piece <ul style="list-style-type: none"> provide a tool balancer for bench work 		✓	med med	med med	med med

Hands/Wrist/Arm (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> Handle diameter is too large The work piece must be moved and turned 	88. Provide an appropriate handle diameter <ul style="list-style-type: none"> provide a tool with an appropriate handle diameter between 1"-1.5". 136. Rotate the work piece <ul style="list-style-type: none"> provide a fixture to allow the work piece to be rotated 		✓ ✓	med med	med med	med med
9. High speed hand/wrist/arm movements or vibration, impact, or torque to the hand	<ul style="list-style-type: none"> The tool has not received proper maintenance 	34. Maintain hand tools/power tools <ul style="list-style-type: none"> perform periodic maintenance on all tools 	✓		low	med	med

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
12. Repeated forward or sideways bending movements	<ul style="list-style-type: none"> Work surface is too low (see Figure 1.1)  <p style="text-align: center;">Figure 1.1</p>	124. Raise the work piece/work surface <ul style="list-style-type: none"> provide a spring loaded pallet jack to elevate the parts bin 136. Rotate the work piece <ul style="list-style-type: none"> turn the work piece to an upright position provide a fixture to allow the work piece to be rotated or raised 83. Provide an adjustable-height lift table <ul style="list-style-type: none"> use for part storage 		<ul style="list-style-type: none"> ✓ 	med low med med	med med med med	med med med med
13. Twisting of the lower back	<ul style="list-style-type: none"> Rarely occurs 	N/A					
14. High speed, sudden movements	<ul style="list-style-type: none"> Rarely occurs 	N/A					

Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
15. Static, awkward back postures	<ul style="list-style-type: none"> • Work surface is too low • Load point too far away 	124. Raise the work piece/work surface		✓	med	med	med
		38. Move closer to the work location	✓		low	low	med
		<ul style="list-style-type: none"> • remove guards during load/unload • redesign fixture to locate part closer to employer 		✓	high	low	med
16. Lifting forces	<ul style="list-style-type: none"> • The work piece is too heavy 	61. Provide a mechanical lift device		✓	high	med	med
		<ul style="list-style-type: none"> • provide a mechanized method for installing and removing the work piece. 					
		124. Raise the work piece/work surface		✓	med	med	med
		<ul style="list-style-type: none"> • provide a spring loaded pallet jack to elevate the parts bin 					
17. Pushing or pulling	<ul style="list-style-type: none"> • Rarely occurs 	N/A					
18. Whole body vibration	<ul style="list-style-type: none"> • Rarely occurs 	N/A					

Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Fixed position, standing	<ul style="list-style-type: none"> Standing surface is hard 	86. Provide an appropriate anti-fatigue mat		✓	med	med	med
		96. Provide appropriate shoe inserts		✓	low	low	low
		52. Provide a footrail or footrest	✓	✓	med	med	med
20. Exposure to hard edges on legs, knees, and feet	<ul style="list-style-type: none"> Work station or work piece has hard or sharp edges 	9. Eliminate exposure to hard edges <ul style="list-style-type: none"> provide padding for edges provide gloves to protect hands 	✓		low low	med med	med med
21. Awkward leg postures	<ul style="list-style-type: none"> Rarely occurs 	N/A					
22. Standing foot pedal	<ul style="list-style-type: none"> Rarely occurs 	N/A					

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
23. Difficult to see/light levels too low/too high	<ul style="list-style-type: none"> Rarely occurs 	N/A					
24. Intensive visual tasks, staring at work objects for long periods	<ul style="list-style-type: none"> Finish quality must be visually inspected (see Figure 1.2)  <p style="text-align: center;">Figure 1.2</p>	22. Increase light levels <ul style="list-style-type: none"> provide task lighting which is easy to adjust ensure that light levels are 200-250 lux (20-25 foot-candles) 	✓	✓	med high	med high	med high