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Risk Assessment in Tack Welding Operation of Manufacturing Industry

Ashish Yadav
M. Tech Student
Department of Fire Technology and Safety Engineering
IES-IPS Academy, Indore (M.P), India

Sandeep Yadav
Assistant Professor
Department of Fire Technology and Safety Engineering
IES-IPS Academy, Indore (M.P), India

Abstract

Tack welding is one of the common phenomena of manufacturing industry which is performed before full welding operation in order provide stability to component for full welding. In this paper we have applied risk assessment method to highlight the safety aspect in tack welding opera-tion. The tack welding operation has involved many hazardous tasks which may lead to accident. We have found all the hazardous activity related to each task and given coun-termeasures to eliminate or reduce risk in order to make working environment safely or accident free for employee.
Keywords: Tack welding, Risk Matrix, Risk Rating; etc

I. INTRODUCTION

Manufacturing industries have evolved in previous decades so drastically and tack welding operation is one of the common operations which are used in manufacturing industry, before performing full welding operation. It is essential to perform tack welding operation in order to avoid misalignment between two heavy components. Tack welding operation provides initial stability between two or more component and it also provides temporary joints. In case of performing full welding operation prior to tack welding operation, component may misalign which can affect quality. Tack welding operation has involved many tasks and each task (minor and major) has potential hazards which can lead to accident, Every accident which is minor or major has effect on economy of industry in terms of time (productive hours), men power, medication, compensation to victims. To avoid such accidents we have applied risk assessment method and found potential hazard related to each task of tack welding operation. Countermeasures have been given for each task in order to avoid accidents and improve work practice safely.

In this paper risk score has been calculated before and after applying countermeasure which also help to do comparative analysis. We have also catego-rized risk into four category low risk, Medium risk, high risk, very high risk which help us to give coun-termeasure accordingly. The purpose of dividing risk into four category is to understand that how potential hazard it could be.

II. METHODOLOGY

For applying this risk assessment method first of all particular operation has to be selected whose risk has to be calculated then the hole operation is break into small task after that each task is examine care-fully and risk is calculated.

These are the steps which are followed for risk as-sessment:

1) Select operation.
2) Brake the operation into task.
3) Describe risk on each task.
4) Calculate risk
5) Apply suitable countermeasures.
6) After giving countermeasures calculate risk again.

In our work we have taken problem in tack welding operation of fabrication area. there are basically seven major task which are involved in gas cutting operation.

1) Pivot fitment: - Pivot is load on fixture for tack welding .pivot is moved by hoist so it is having fall-ing hazard, hit/ crush hazard.
2) Boom box fitment:- It is heavy component which can cause strain while pulling & pushing it to fix-ture.
3) Pivot (Dipper end) fitment: - Material is lying on the floor which can cause slip/trip hazard.
4) Clamping process: - Use of improper and damage tool can cause of injury.
5) Welding operation: - Operator may expose to welding fumes and rays.
6) De-clamping:- Excessive force required for de clamping operation due to tight grip.
7) Unloading of boom assembly from fixture: - Im-proper lifting practice can cause falling of compo-nent.

Risk: - Risk can be calculated by applying mention below formula.

R = P X G X C

Where;

R= Risk
P = Probability of occurrence
G = Gravity (degree of harm)
C = Control

Table 1: Risk Rating of Probability

Score/rating	*Probability*
1	*Low*
2	*Medium*
3	*High*
4	*Very high*

Table 2: Risk Rating of Gravity

Score/rating	*Gravity*
1	*Very slightly harmful*
2	*Slightly harmful*
3	*Harmful*
4	*Extremely harmful*

Table 3: Risk Rating of Control

Score/rating	*Control*
1	*Elimination or substitution that eliminates hazard*
2	*Engineering Controls takes place*
3	*Training/Procedures/PPEs in place to minimize risk*
4	*Either no controls to reduce risk or controls have failed*

– Seven Sequential Steps of Tack Welding Operation

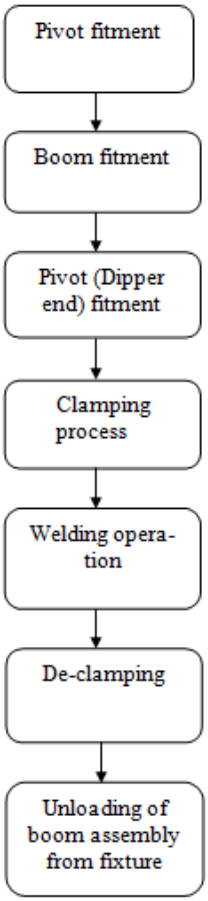

Table - 4

	AREA :-Fabrication	WORK STATION:- Boom tack welding						DATE:-……	AUDITOR:-				
				Before						After			
	Risk Description	Apply	Task	P	G	C	R	Describe Risk	Countermeasure Description	P	G	C	R
Material movement	Do parts drop from lifting devices?	Y	1	2	2	3	12	Falling of component on worker	Lifting tackle	1	2	2	4
	Are Hoists, cranes, ropes, hooks, chains in good condition?	Y	1	1	2	3	6	Bad condition of lifting device may lead to accident	The Ropes are checked every six monthly	1	2	2	4
Ergonomic	Is there reaching below waist?	Y	1	1	2	3	6	Bending every time while picking component	Provision of heighted stand	1	1	2	2
General/5s	Are there any cut hazards?	Y	2	1	2	3	6	Cut on hand due to sharp edge	PPEs(gloves)/visual signs, OJT	1	1	3	3
	Is Area free of slip/trip hazard?	Y	2	2	2	3	12	Material Lying on floor	Provision of stand or bin	1	2	2	4
Material movement	Do parts drop from lifting devices?	Y	2	2	3	3	18	falling of boom can injured worker	Use Lifting tackle	1	2	2	4
Ergonomics	Is there reaching above shoulders?	Y	2	2	2	4	16	Ergonomic risk	Provision of platform	1	1	2	2
	Is excessive force required to push/pull object?	Y	2	1	2	3	6	While Pulling pushing hoist strain may develop	Maintenance	1	2	2	4
Material movement	Are walkways in good condition and with free access?	Y	3	1	2	3	6	Floor is damage (person may fall)	Construct damaged floor	1	2	2	4
	Do parts drop from lifting devices?	Y	3	2	2	3	12	falling of pivot on worker	Lifting tackle	1	2	2	4
General/5s	Are tools in good condition?	Y	4	2	2	3	12	Temporary welded hammer may break & hit the operator	Change the tool, routine check up	1	1	2	2
	Are tools, material & equipment in designated location?	Y	4	2	2	3	12	Tool may fall on operator	Provision of tool stand	1	2	2	4

Table – 5

	AREA :-Fabrication	WORK STATION:- Boom tack welding						DATE:-……	AUDITOR:-				
				Before						After			
	Risk Description	Apply	Task	P	G	C	R	Describe Risk	Countermeasure Description	P	G	C	R
General /5s	Is there particle projection hazard	Y	5	2	3	3	18	operator's eyes& other body part may expose to spatter	PPEs(face shield, gloves)/visual signs	1	2	3	6
	Are there Hit hazards from machine / Part? or any exposed body parts)	Y	5	2	2	3	12	Low height of welding stand may cause head injury	Increase the height of welding stand	1	1	2	2
	Is there contact with hot items?	Y	5	2	2	3	12	Burn injury	PPEs(leather gloves)/visual signs	1	2	3	6
Chemical	Is there any expose to fume?	Y	5	3	3	3	27	It can cause respiratory problem(short breathing)	Fume extractor, proper ventilation	2	1	2	4
Ergonomi	Is excessive force required to push/pull object?	Y	6	1	2	3	6	Tight grip	Maintenance	1	2	2	4

General /5s	*Are there any contacts with hot items?*	*Y*	*6*	*2*	*2*	*3*	*12*	*Recent welded boom is Hot which can cause burn injury*	*Hand Gloves, visual aid, SOP*	*1*	*1*	*3*	*3*
	Are correct tools being used?	*Y*	*6*	*2*	*2*	*3*	*12*	*Incorrect tool may cause of injury*	*provide correct tool*	*1*	*1*	*2*	*2*
	Are tools, material & equipment in designated location? (so they won't fall on operator)	*Y*	*6*	*2*	*2*	*3*	*12*	*Tool may fall on operator*	*Design tool stand, O.J.T(on job training),visual aid*	*1*	*1*	*2*	*2*
Ergonomic	*Are there awkward postures (rotation angle of waist, stooping, bent back, bending at waist, twisting at waist)?*	*Y*	*6*	*2*	*2*	*3*	*12*	*Fatigue, strain in body*	*Provision of stool*	*1*	*2*	*2*	*4*
	Is excessive force required to push/pull object?	*Y*	*7*	*1*	*2*	*3*	*6*	*While Pull/push crane strain may develop*	*Maintenance*	*1*	*2*	*2*	*4*

Table - 6

Risk matrix			
18	*32*	*48*	*64*
8	*16*	*27*	*36*
3	*6*	*12*	*24*
1	*2*	*4*	*9*

Table- 7

Risk Levels	
Very high risk (24-64)	*This risk is intolerable. Immediate action of prevention and protection needed to be taken. Temporary countermeasures should be taken immediately and action plan for final solution should be started and take place within 1 month.*
High risk (9-18)	*Preventive and Corrective action to reduce the risk are required. Temporary countermeasure should within 1 month and action plan for final solution within 3 months.*
Medium risk (4-8)	*Regular Checks are required to ensure that the risk is under control. Continuous monitoring is also required to ensure that risk is not growing further. Preventive and corrective actions can be taken.*
Low risk (1-3)	*This is green zone which shows that the risk is tolerable. In the area the risk is under control. Risk management through PPEs utilization.*

III. RESULT & DISCUSSION

After applying risk assessment we have minimized high & very high risk and bring it to tolerable limit. The table below shows difference between before and after applying countermeasures.

	Before	*After*
Very high risk	*1*	*0*
High risk	*14*	*0*
Medium risk	*7*	*14*
Low risk	*0*	*8*

IV. CONCLUSION

We have applied risk assessment methodology which contributed to minimize risk from very high or high risk to medium or low risk. Risk rating has been calculated before giving countermeasure and after giving countermeasure which helps to under-stand risk reduction level before and after. As per the methodology the tack welding operation broke into tasks which helped to understand that how many hazards are associated with each task. It helps to improve work place safety

REFERENCES

[1] Ashish Yadav, Abhaynath Kumar, Sandeep Yadav praposed ‘’Safety Risk Assessment in CNC GAS Cutting Machine of Mechanical (Manufacturing) Industry’’.

[2] A book by Clifton A. Ericson, II ,Hazard Analysis Techniques for System Safety,Hazard Analysis Types and Techniques , a John Wiley & Sons, Inc. Publication.
[3] M.C. Gerstenbergera, A. Christophersena, R. Buxtona, G. Allinson Integrated Risk Assessment for
[4] CCS, Energy Procedia 37(2013) 2775 – 2782.
[5] Mou Ruifang, The Risk Assessment Method of Lighting Disaster on Railway Signal system, Procedia Engineering, 43(2012) 413 – 418.
[6] Chunlin Liua, Chong-Kuan Tan, Yea-Saen Fang, Tat-Seng Lok, The Security Risk Assessment
[7] Methodology, International Symposium on Safety Science and Engineering in China, 2012.
[8] James E Rauhten, Nathan cruth field, workplace Hazard Analysis and Review of Associated Risk Job
[9] Fundamentals of Industrial Safety & Health- K.U. Mistry.