SAFE OPERATING PROCEDURE FOR FETTLING OPERATIONS AND AIR POLLUTION CONTROL IN FOUNDRY

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Abstract— ***The ultimate aim of an industry is to create a work place safe for their workers. One of the important ways to achieve a safe working place is a safe working procedure. The aim of my project is to observe and analyze all unsafe working procedure in all fettling operations and then prepare a Safe operating procedure in each operation in fettling area.***

A substance in the air that can be adverse to humans and the environment is known as an air pollutant. Pollutants can be in the form of solid particles, liquid droplets, or gases. In addition, they may be natural or man-made. Controlling and curtailing air pollution from industrial sources is essential to improving Canadian air quality. Industrial sources of air pollution include factories, electrical generation plants and incinerators. Because these sources exist in fixed locations, they are often referred to as "point sources". Air pollution is the major and obvious hazard in the industry like cement industry, foundry, mines etc. controlling or eliminating air pollution is very essential has it may cause harm to the workers instantly or chronically. The aim of my project is to perform source emission monitoring & ambient air quality monitoring and compare with National Ambient Air Quality Standards and control them with proper control measures.

Index Terms— Fettling, Ambient, Source and safe operation.

I. INTRODUCTION

My project is about analyzing the unsafe working procedures in each operation in fettling and preparing the safe operating procedure (SOP) for each operation in fettling area SOPs should not be confused with pre-incident plans or pre-plans, which describe strategies for emergency response at a specific facility. Pre-plans allow the department to gather information on designated locations, identify potential hazards, and assess site-specific factors. SOPs, on the other hand, are more generic in nature. They address general functions like equipment placement and tactical operations, and they are applicable to all emergency incidents, or at least to a specific category or type of emergency situation.

And then eliminating or controlling air pollution form the source or in between or at the destination in the foundry. Air pollution is a significant risk factor for multiple health conditions including respiratory infections, heart disease, and lung cancer, according to the World health organization. The health effects caused by air pollution may include difficulty in breathing, wheezing, coughing, asthma and aggravation of existing respiratory and cardiac conditions. These effects can result in increased medication use, increased doctor or emergency room visits, more hospital admissions and premature death. The human health effects of poor air quality are far reaching, but principally affect the body's respiratory system and the cardiovascular system. Individual reactions to air pollutants depend on the type of pollutant a person is exposed to, the degree of exposure, the individual's health status and genetics.

A. SAFE OPERATING PROCEDURE

SOPs(safe operating procedure) may be prepared for any function that industrial operation requires; including manufacturing, operation, maintenance, administration (hiring, equipment maintenance, building inspections, rehabilitation, etc.) and emergency response operations (fire suppression, medical services, hazardous materials response, etc.). The procedures can be organized and presented in many different ways, depending on the department's needs and preferences.

SOPs are not intended to duplicate technical information or provide step-by-step instructions for doing the job. The knowledge and skills that personnel need to perform specific job tasks-raw material handling, furnace operation, fettling and finishing operation, manage programs, fight fires, providing medical care, etc.- are addressed in technical protocols and professional training. SOPs, conversely, describe related considerations: safety, use of supplies, equipment maintenance, duties and rights of personnel, command structures, coordination with other organizations, reporting requirements, and so forth.

Increasing legal and regulatory requirements—safe work practices, public and employee right-to-know, equal opportunity (race, gender, age, disability), performance standards, employee relations, and much more.[7]

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B. AIR POLLUTION CONTROL:

If the foundry industry's air pollution problem were confined to the collection of solid contaminants from shakeout and cleaning room operations, the physical difficulties involved in satisfactory collection would be minor and the financial hardship would be minimized. It should be pointed out also that besides gray iron founding there are other major branches of the foundry industry, such as nonferrous, malleable, and steel. Each of these has air pollution problems peculiar to it, although they all have some in common.[9]

The physical difficulties of satisfactory collection of some types of foundry pollutants are not easily solved and in some cases the cost of satisfactory collection may be prohibitive. For example, in many nonferrous shops, a large number of small furnaces is used. Because of the different alloys being melted, the operation of the furnaces may be intermittent, some not being used more than once a week.

If all are connected to a single collector, needless horsepower is used during furnace stand-by time. If each furnace is connected to its own collector equipment, space and cost may be prohibitive. Emission rates of various foundry sources vary even with the same piece of equipment. Thus, one must design collection equipment satisfactory for the highest anticipated emission rate. Furthermore, many foundry effluents are hot and must be cooled before collection. If recirculated water is used for cooling, corrosion problems may be introduced; if fresh water is used, water cost may be high. Most metallic oxides from melting operations are less than0.5 micron in size, requiring very efficient equipment for satisfactory collection.

II. METHODOLOGY

SAFE OPERATING PROCEDURE FOR FETTLING AREA

A. Identifying and observing all operations in fettling.

B. Safe operating procedure for each operation in fettling areas are:

1. Shot blasting
2. Grinding
3. Cutting
4. Supervisor
5. Tractor operator
6. Fork lift operator

C. Implementing SOP in each operation in fettling.

AIR POLLUTION CONTROL IN FOUNDRY

1. Measure of air pollution level in different exposure and sections of industry.

Using Air sampler the air pollution level will be identified for individuals working at different section of the work area who are exposed to air pollution.

2. Complying to the National Ambient Air Quality Standards.

After collecting the data's from various all places the data is tabulated and organized and then they are verifying with the National Ambient Air Quality Standards available or applicable.

3. Control of air pollution level

The most frequently encountered equipment for the removal of solid particulate matter from an air stream or gas stream is the fabric dust collector or bag house. With a mass median size of 0.5 μm, a collection efficiency of 98-99+% can be expected. As the filter medium becomes coated in a fabric collector, the collection efficiency rises. However, as material continues to build on the bag surface, higher pressure drops occur, which result in a significant reduction in airflow.

To maintain design flows, the bags must be cleaned periodically by mechanical shaking or with pulsed air. Filter media are now available for hot corrosive atmospheres, such as furnace emissions. Operating inlet temperatures up to 500°F (260°C) are not uncommon. High humidity can be a problem if no provision is included for the condensation of free moisture. In case of poor maintenance of these installed bag house filter or scrubber the emission level of particulate matter will reach to near by its standards so by avoiding this online monitoring should be installed and continuously monitor the emission level in case emission level is increasing means we indentify and give proper maintenance to the bag house filter or scrubber.

III. RESULT

SAFE OPERATING PROCEDURE FOR FETTLING AREA

Safe Operating Procedure has been created for all fettling operations and verified with safety officer. Then made some modifications and recommendations in the SOP has suggested by him and was approved. Soon it will be implemented has a safe working procedure which will result in reduction of accidents. Example of one safe operating procedure is given below:

SAFE OPERATING PROCEDURE FOR SHOT BLASTING (HANGER TYPE MACHINE)

SCOPE:

This describes the procedure to operate the SHORT BLASTING (Hanger type machine) in safe manner.

RESPONSIBILITY:

Shot blasting machine operator is responsibility for loading, unloading of machine.

PROCEDURE:

1. When machine door is open condition no person should stand beside the door.
2. Shot balls should be filled after stopping the m/c.
3. No maintenance or check is done while the machine is running.

4. Switch on the dust collector fan and bucket deviators one by one.
5. Check hanger is in proper position with drag chain.
6. Monitor the speed of the hook and incase becomes high immediately reduce the speed of the spinning.
7. Shot blasted casting should be kept in the respective area.

MANDATORY PERSONAL PROTECTIVE EQUIPMENTS

1. Safety helmet
2. Mask
3. Safety Shoe
4. Goggle
5. Ear plug and muff
6. Leather Glove

AIR POLLUTION CONTROL IN FOUNDRY

It is suggested to install a continues monitoring system for air pollution by placing sensors on every stacks, wet scrubber and dry scrubber. They will provide alarms to alert when the air pollution level reaches close to the IS permissible limit. So that the sustainability of pollution limit lesser than permissible limit is guarantied.

IV. CONCLUSION

SAFE OPERATING PROCEDURE FOR FETTLING AREA

Thus by observing all the working procedure of each operation in the fettling area, all unsafe working procedure was identified and accessed. Then Safe Operating Procedure (SOP) was developed for all fettling operations and implemented. It also provides better working condition in each fettling operations and makes the working environment free from hazards.

AIR POLLUTION CONTROL IN FOUNDRY

Thus by implementing the continues air pollution monitoring in all stack emission and scrubbers the sustainability of pollution limit lesser than permissible limit is guaranteed.

REFERENCES

1. P. Monmousseau, M. Fillon, "Transient thermoelastohydrodynamic analysis for safe operating conditions of a tilting-pad journal bearing during start-up" Universite´ de Poitiers, Laboratoire de Me´canique des Solides, UMR CNRS 6610, S.P.2M.I, BP 179, 86960 Futuroscope, Cedex, France-2000.

2. Charles S. Whitman, "Defining the safe operating area for HBTs with an InGaP emitter across temperature and current density" RFMD, 7628 Thorndike Road, Greensboro, NC 27409, United States-2007.

3. Jinkyung Kim, "Synthesis of safe operating procedure for multi-purpose batch processes using SMV" Department of Chemical Engineering, Yonsei University, Seodaemoon-ku Shinchon-dong 134, Seoul 120- 749, South Korea-2000.

4. Muhammad Abid, "Determination of safe operating conditions for gasketed flange joint under combined internal pressure and temperature: A finite element approach" Faculty of Mechanical Engineering, Ghulam Ishaq Khan Institute of Engineering Sciences and Technology, Topi-23460, NWFP, Pakistan-2005.

5. Jung Wan KOO, Chee Kyung CHUNG, Chung Yill PARK, the Effect of Silica Dust on Ventilatory Function of Foundry Workers: J Occup Health 2000; 42: 251–257.

6. Thomas J. Nelson, Performance of an N95 Filtering Face piece Respirator in a Grinding Operation, Journal of the International Society for Respiratory Protection, Vol. 24.(24 August 2006).

7. Jinkyung Kim, "Synthesis of safe operating procedure for multi-purpose batch processes using SMV" Department of Chemical Engineering, Yonsei University, Seodaemoon-ku Shinchon-dong 134, Seoul 120- 749, South Korea-2000.

8. Kyu-Min Song, Soon Hwan Sohn, Yang Geun Chung, "The development of standard operating procedures for the SDS of the ITERtritium plant" KEPRI, 103-16 Munji-dong, Yuseong-gu, Daejeon 305-380, Republic of Korea-2008.

9. Mats Holmgren and Peter Nayström* The Green Foundry, Foundry Trade Journal, pp. 15-17, July/August 2007.

10. Lu Yan, "Study on forming and comparing of regional air pollution control audit model," Remote Sensing, Environment and Transportation Engineering (RSETE)"-2005.

11 R. Margraf, "Replies to Challenges in the Field of Air Pollution Control in Foundry Plants" LÜHR FILTER GmbH & Co. KG, Enzer Straße 26, 31655 Stadthagen, Germany- ISSN (2299-2944) Volume 12 Issue 3/2012.

12 M. T. Abedghars, in his article " Monotoring of air quality in an iron foundry Research Unit on iron and steel industry URASM/CSC, Annaba Algeria"-2011.

13. Prof Andy P Smith and Dr Emma J K Wadsworth for "Safety culture, advice and performance" The associations between safety culture and safety performance, health and wellbeing at an individual level, and safety culture, competent occupational safety and health advice, and safety performance at a corporate level. Report submitted to the IOSH

Research Committee, Centre for Occupational and Health Psychology, Cardiff University.

14. Myers, E.; Francis, C., "Simulation-based electrical safety training: An innovation in safety culture," Electrical Safety Workshop (ESW), 2011 IEEE IAS , vol., no., pp.1,3, 25-28 Jan. 2011

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