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SAND BLASTING MACHINE

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Abstract: - Sandblasting may be a general term which is employed to explain the act of propelling very fine bits of fabric at a high velocity. This process is employed for cleaning or etching the surface before the treatment of the surface. Prior to powder coating, painting or spray galvanization, metals are required to be sandblasted consistent with their surface conditions. The use of diverse blasting materials creates various sorts of surface results. The aim of the present work is to analyze the performance of sandblasting as a solution for resurface treatment of materials. It uses materials such as concrete, brick, cement, metal & other materials predispose workers exposed to health conditions related to respiratory diseases, which together with an inadequate & non-existent use of personal protection elements and lack of knowledge about their use, indicates the condition caused by this pollutant present in industries, can be prevented, while silicosis, a disabling disease and difficult treatment, takes lives of workers around the world.

Keywords: *Sandblasting, Powder Coating, Substrate, Respiratory Disease, Silicosis*

I INTRODUCTION

Modern technology development confronts many engineers with problems that they need to unravel. The event of recent technologies is related to the emergence of recent construction materials. There also are modifications and enhancements of materials known for an extended time. For the processing of recent materials, modifications of well-known methods of their processing are often used, like micro welding. One among the kinds of known machining methods is surface treatments. Surface treatments are widely utilized in modern production processes. Thanks to their diversity and flexibility, it's possible to use complicated technologies like laser technology or relatively simple thermal methods to implement them. Their diversity means surface treatments are utilized in many cases, for instance , changes within the functional properties of the native material (e.g. surfacing) applying various coatings (protective, decorative, technical, etc.) or as finishing treatment

II TYPES OF ARRANGEMENT

1. Pressure Blasters: Pressure blast systems are the systems which are ten times simpler and quicker than the suction blasters. They're also easier to use. They contain large container comprising of silica sand under high. A gun is joined to the upper portion of the container with the assistance of a hose which will breathe abrading effects of sand.

2. Siphon/Suction Blasters: these blasters are moderately cheap and are more likely to seek out. They contain three main parts. A sandblasting gun with two hoses of which one hose is connected to rock bottom of the handle and therefore the other hose is connected to the lower side of the barrel. It's a repository of loose sand. Some sort of container or bucket is made by this sort. Because the gun is fired, the air creates a suction that pulls the sand into the gun. Now sand is often reused by collecting it and placing back to the reservoir.

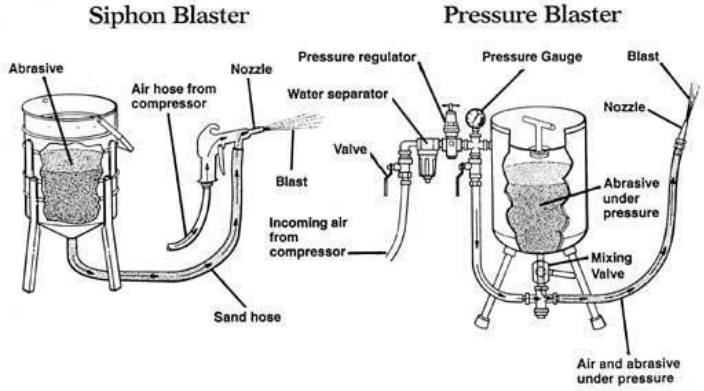

FIG.1.SIPHON & PRESSURE BLASTER

III TYPES OF MEDIUM USED.

METALLIC**:** Steel shot, steel grit, chrome steel shot, cut wire, copper shot, aluminum shot, zinc shot. Many coarser media utilized in sandblasting often end in energy being given off as sparks or light on impact**.**

IV COMPONENTS USED

1. Air compressor: Air compressor is a mechanical device which increases the pressure of the air by decreasing its volume.
2. Nozzle: Abrasive blast cleaning nozzles are used in many surface preparation applications. To maximize productivity of abrasive blast cleaning system it is important to select correct carbide nozzle for media being used
3. Cylinder: It is used to store the abrasive medium that is been used to in the process and also it is been a main

component in the process because all the mounting that are required in the process.

4. Pressure Gauge & Pressure Regulator: Pressure gauge is used to record the given pressure and pressure regulator is used to regulate the coming pressure coming from the compressor
5. Water Separator: Water separator is used to separate the moisture from abrasive medium
6. Control valves: The control valves are used to control and regulate the given pressure
7. Pipe is used to transmit the pressurized medium into the work piece

V RISKS PRESENT IN THE PROCESS

A. Health risk: The deterioration of the health of workers due to respiratory diseases derived from work and its consequences directly affects the productivity of companies and finally affect the economically active population, in primary and secondary sectors. In most underdeveloped countries, the frequency with which the diagnosis of this group of diseases is made in a timely manner is relatively low in most workers the diagnosis is delayed because the natural evolution of the disease is slow; Symptoms appear after 5 years of exposure. However, if the frequency and level of exposure is very low, the time of clinical progression may be longer. Since silicosis is irreversible and incurable, the removal and control of silica particles is practical importance, for the prevention of silicosis and for the reduction of deaths and related costs, identify high risk workers. Occupational exposure to silica particles is a known risk factor. However due to the fact that not all individuals who have an exposure history develop lung fibrosis, genetic factor also contribute to the risk of disease

B. Safety hazards: it include those associated with the abrasive blasting equipment itself, vision impairment, slipping, flying abrasive, fire, explosion, and static electricity. These include

a. Vision Impairment: When air flow around the operator and work area is not sufficient, a dense dust cloud often develops. This creates vision impairment which may contribute to a serious accident. Etching of glass shades by abrasive contact also can cause vision impairment and associated accident potential.

b. Slipping Hazard: Settlement of some dust s on floors in work and other areas may lead to a serious slipping hazard, especially so because slippery qualities of the dust may not be readily perceived.

c. Explosion Hazard: In certain cases, especially when organic abrasives are being used in a closed area, dust clouds can lead to an explosion hazard. The source of ignition might be nothing more than a spark created by a shoe-nail scraping against a metal surface

VI RESEARCH RELATED TO OCCUPATIONAL RISK

AUTHOR / YEAR	TITLE OF THE INVESTIGATION
Fernández (2015)	Regulations for the diagnosis and monitoring of silicosis
Rodríguez (2015)	Diffuse interstitial lung diseases in the workplace
Veiga (2015)	Health risks and recommendations in the management of nanoparticles in work environments

VII PRETREATMENT OF SURFACE

1.Pretreatment for galvanized sheets: Similar to Aluminum, the galvanized material has a strong tendency for producing a very thin coat of zinc carbonate or zinc oxide on surface by undergoing corrosion, which is commonly called as White Rust. The material which is galvanized generally has a strong tendency to produce a layer of white rust on its surface which is a bad base for application of powder or any other coating on the surface. Therefore, it must be removed prior to powder coating. Besides this, there are chances of presence of oil on the material surface which may have come during the fabrication process. This layer is necessary to remove for having proper bonding of powder coating.

2.Pretreatment for mild steel: Picking up the rust and dirt when the material is exposed to bare atmosphere is the tendency of material. Sandblasting is completed to get rid of the oil, grease, rust and black scale formed on the surface. Mild steel material is also recognized for its tendency of undergoing rapid oxidation when exposed to bare atmosphere. To avoid this, material is not directly exposed to bare atmosphere. For this, we mostly make use of rust preventive oil on low-carbon steel surface. This oil doesn't allow metal to contact directly with the air and thus deferments oxidation

VIII LITERATURE REVIEW

According to this, the acute or chronic exposure to the emission of particulate material can generate not only occupational health problems such as respiratory affections, eye irritation, skin, nose and mouth, but can cause industrial-type problems such as explosions and fires. Plants, damage to equipment, or low visibility in the workplace. In addition to this, the emission of particulate matter can generate problems in neighboring communities and be a cause of complaints and diseases.

A research developed by Zhang (2010), in China, aimed to figure out the connection between silicosis among foundry workers and their cumulative exposure to silica dust and

establish a regression model to predict the danger of developing silicosis for a given duration of employment and air concentrations of silica in workplaces. The study was developed with a cohort of 29 years, including all employees for quite one year during the amount from January 1, 1980 to New Year's Eve, 1996, and every one members of the cohort were followed up New Year's Eve , 2008. In total, A car foundry in Shiyan, Hubei Province was recruited within the studio, 1300 in eight work sites including sand preparation, shake mold, and finishing, melting, molding, and core-making, the operation of Grus and pour as an exposed group, and thus the opposite 709 auxiliary workers of the same factory, like electricians, inspectors, installers, etc., as an impact group. Concluding that foundry workers in China still face a high risk of developing silicosis. to scale back the presence of silicosis in exposed workers, it seems necessary to reexamine the present occupational exposure limits for silica in workplaces in China and strengthen control measures for silica dust.

In this paper, the review was made about the pretreatment of the surface treatment which is that the surface treatment before the coating, how the improper treatment can cause trouble during operation. It is said that if the improper pretreatment can cause of about 80% of mechanical failure which in turn can cause major fault in surface. Hence whenever we do the pretreatment of surface we have to take utmost care during the process, due to which we could coat, anodization, and powder coating. Proper pretreatment includes proper sand blasting process

IX CALCULATION

1 atm. Pressure =1.01325 bar

1 hp = 5 bar

We are using 10 hp compressors for sand blasting

Therefore 10 bar = 2 hp compressor is required

1 cfm = 12.5 psi

1 psi = 0.0689 bar

Therefore 12.5 psi = 12.5 x 0.0689

= 0.86125 bar

Therefore 1 cfm = 12.5 psi

= 0.81625 bar

0.689 bar = 1 psi

Therefore 5 bar = 72 psi

1 hp = 72 psi

1 bar = 14.4 psi

We are using 3 mm nozzle for the sand blasting

For 3 mm nozzle the pressure generated at nozzle will be 100 psi

Sand blasting through 3 mm nozzle requires compressor of 10 hp

Therefore we require 50 bar compressor

The sand coming out of nozzle is at the speed of 264 lbs/hrs

264 lbs/hrs = 120 kg/hr

Therefore 120 kg of sand is used in 1 hour,2 kg will be used in 1 min & 0.3 kg in 1 second 34

The abrasive being used is of 2.64 cfm

The air cfm generated at 3 mm nozzle is 45

Nozzle orifce Ø		50
5mm	3/16"	26
6mm	1/4"	47
8mm	5/16"	77
10mm	3/8"	108
11mm	7/16"	147
12.5mm	1/2"	195

CHART REPRESENTING THE NOZZLE ORIFICE DIAMETER

Nozzle Orifice	Pressue at the Nozzle (psi) 50	60	70	80	90	100	125	140	Air (In cfm) Abrasive HP requirements
No. 2 (1/8")	11	13	15	17	18.5	20	25	28	Air (cfm)
	.67	.77	.88	1.01	1.12	1.23	1.52	1.70	Abrasive (cu.ft/hr)
	67	77	88	101	112	123	152	170	lbs/hr
	2.5	3	3.5	4	4.5	5	5.5	6.2	Compressor hp
No. 3 (3/16")	26	30	33	38	41	45	55	62	Air (cfm)
	1.5	1.71	1.96	2.16	2.38	2.64	3.19	3.57	Abrasive (cu.ft/hr)
	150	171	196	216	238	264	319	357	lbs/hr
	6	7	8	9	10	10	12	13	Compressor hp
No. 4 (1/4")	47	54	61	68	74	81	98	110	Air (cfm)
	2.68	3.12	3.54	4.08	4.48	4.94	6.08	6.81	Abrasive (cu.ft/hr)
	268	312	354	408	448	494	608	681	lbs/hr
	11	12	14	16	17	18	22	25	Compressor hp
No. 5 (5/16")	77	89	101	113	126	137	168	188	Air (cfm)
	4.68	5.34	6.04	6.72	7.40	8.12	9.82	11.0	Abrasive (cu.ft/hr)
	468	534	604	672	740	812	982	1100	lbs/hr
	18	20	23	26	28	31	37	41	Compressor hp
No. 6 (3/8")	108	126	143	161	173	196	237	265	Air (cfm)
	6.68	7.64	8.64	9.60	10.52	11.52	13.93	15.6	Abrasive (cu.ft/hr)
	668	764	864	960	1052	1152	1393	1560	lbs/hr
	24	28	32	36	39	44	52	58	Compressor hp
No. 7 (7/16")	147	170	194	217	240	254	314	352	Air (cfm)
	8.96	10.32	11.76	13.12	14.48	15.84	19.31	21.63	Abrasive (cu.ft/hr)
	896	1032	1176	1312	1448	1584	1931	2163	lbs/hr
	33	38	44	49	54	57	69	77	Compressor hp
No. 8 (1/2")	195	224	252	280	309	338	409	458	Air (cfm)
	11.60	13.36	15.12	16.80	18.56	20.24	24.59	27.54	Abrasive (cu.ft/hr)
	1160	1336	1512	1680	1856	2024	2459	2754	lbs/hr
	44	50	56	63	69	75	90	101	Compressor hp

**Consumption rates are based on abrasive that weighs 100 pounds per cubic foot

COMPRESSED AIR REQUIREMENT & ABRASIVE CONSUMPTION CHART

X CONCLUSION

Development of sandblasting activities with the use of materials such as concrete, brick, cement and other materials for construction and combustion fumes without the adequate

provision of insulating devices that reduce exposure to silica particles predispose workers exposed to conditions of health related to respiratory diseases, along with economic activities such as mining, quarries, and metalworking are accompanied by various risks of a mechanical and chemical nature, the latter standing out in processes where the use of gas, oil or exposure to materials of quartz in different tasks of the construction sector make evident the possible future affectation of the working population around the industry that uses the sandblasting as an operation within the process or economic activity. Detected health complications as deadly as silicosis, only treatable with a lung transplant, make the activities applied to sandblasting (welding, grinding, cleaning and coating of metal surfaces of high hardness) one of the most highly harmful occupational respiratory disease predisposing in the recent industry, to be related to cancer risk from exposure to silicon carbide and other particles. it can cause if not controlled in its generation and medium of propagation in the jobs, forcing the use of personal protection elements that meet the technical characteristics and prevent their appearance, only this way it would be achieved according to documentary supports of the consulted studios a reduction of the deaths and costs of an already recognized and dangerous disease of the work

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