International Journal of Latest Engineering Research and Applications (IJLERA) ISSN: 2455-7137

Volume – 02, Issue – 03, March – 2017, PP – 103-105

PITTING RUST REMOVAL BY USING UNCONVENTIONAL MACHINING PROCESS

N. RAJESH
ASSISTANT PROFESSOR
MECHANICAL ENGINEERING DEPT
ROEVER ENGINEERING COLLEGE

K. SOLAIRAJAN
ASSISTANT PROFESSOR
MECHANICAL ENGINEERING DEPT
ROEVER ENGINEERING COLLEGE

Abstract : The boiler tubes are exposed to environment lead to corrosion .inter granular corrosion trans granular corrosion and ultra granular corrosion. the corrosion which is defined as an metal surface is affected by an chemical reaction due to exposed in the environment the localized corrosion are mainly affect the steel pipe this corrosion is also called as pitting the metals is eaten away and performed in place in the manner of holes the rest of surface being affected only .the pitting produce an deep hole on the surface. This rust on the surface is removed by sand blasting process generic term for the process of smoothing shaping and cleaning a hard surface forcing a solid particles . Across that surface at high speed 2-3 microns it removes the surface. But the pitting corrosion are deep up to 0.1 mm .so we have to make the removal rate up to 0.1 mm so we introduce an machine named as auxiliary abrasive belt for rust removing this remove metal up to 0.1 mm so that the pitting corrosion are encountered. This method is used because it reduce the transportation time for surface removal and increase the production rate it give good result compare to conventional method This process is called as unconventional machining process there are different types of abrasive machining process this is one of that method we use this by keeping the abrasive particle in the belt which removed and the surface finish also ate place in the same process so no need for special surface finishing operation

Keywords: corrosion, pitting corrosion, unconventional machining process

INTRODUCTION

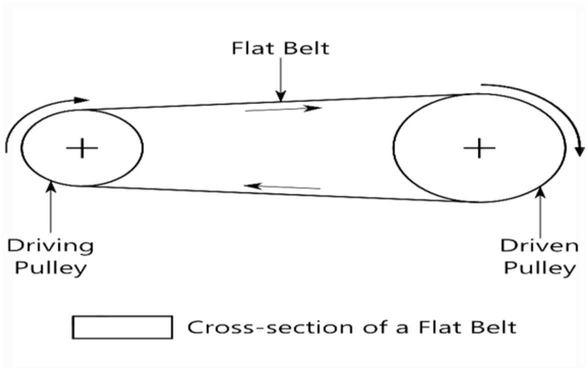
The seamless steel industry is almost one century old. The prime reason for the development was provided by transportation sector. Petroleum sector consumes largest quantities of seamless tubes. The Indian seamless tube industry is about 55 Years old. The first plant was set up as a Joint venture between TISCO and Stewart Lloyds of UK at Jamshedpur and after disinvestment by Stewart Lloyds the plant is being run with an installed capacity of 55,000 TPA. seamless pipes are used where strength, resistance to corrosion and product life is crucial. Ultra high strength and corrosion-resistant properties make these perfect for oil and gas industry, steam boilers, chemical and other processing industries, pipelines, installation with high and supercritical steam and pressure conditions, etc. Seamless pipe manufacturing uses hot rolled round bar billet of carbon steel or steel alloy. The billets are cut into suitable length depending on the required length of the finished tube. The billets are heated in a furnace at a temperature of 1200 0C to 1300 0C.Then the seamless tube is formed by drawing a solid billet over a piercer to create the hollow shell (mother blanks).These hollows are crimped at one end in hot condition and then they are air cooled The tubes are then surface treated (pickled, phosphate coated and lubricated) to facilitate the next process of tube drawing. Depending on the finished sizes required, the tubes are subjected to single, double or triple drawing. After every draw the tubes are annealed at a temperature of 750 0C. The tubes are then straightened and cleaned if necessary and before being cut to the exact size required. The finished tubes are tested for quality and they are marked and coated with rust preventive oil before being bundled and dispatched. these tubes are stored in factory science it is large in numbers they are not properly stored science their exposed area to the environment start corroding to encounter this corrosion we introduced this project and wit this project the operations are reduced These seamless tubes are mainly affected by corrosion is the gradual destruction of materials, (usually metals), by chemical reaction with its environment. In the most common use of the word, this means electrochemical oxidation of metals in reaction with an oxidant such as oxygen. Rusting, the formation of iron oxides, is a well-known example of electrochemical corrosion. This type of damage typically produces oxide(s) or salt(s) of the original metal. Corrosion can also occur in materials other than metals, such as ceramics or polymers, although in this context, the term degradation is more common. Corrosion degrades the useful properties of materials and structures including strength, appearance and permeability to liquids and gases. Many structural alloys corrode merely from exposure to moisture in air, but the process can be strongly affected by exposure to certain substances. Corrosion can be concentrated locally to form a pit or crack, or it can extend across a wide area more or less uniformly corroding the surface. Because corrosion is a diffusion-controlled process, it occurs on exposed surfaces. As a result, methods to reduce the activity of the exposed surface, such as passivation and chromate conversion, can increase a material's corrosion resistance. However, some corrosion mechanisms are less visible and less predictable. This corrosion is of different type they are . Pitting Corrosion Soil Corrosion High temperature Corrosion and Filly form Corrosion these corrosion are being in the seamless tube so we need to remove corrosion before it been welded to the boilers we use shot blasting methods to remove these corrosion even then the corrosion named pitting corrosion which is deep enough to 0.1to 0.3mmThis have to be removed this cannot done in shot blasting method we need to go for surface finishing to obtain this process after shot blasting we introduce our auxiliary abrasive belt machine Corrosion is a process of formation of the compound of pure metal by the chemical reaction between metallic surface and its environment. It is an oxidation process. It causes loss of metal. Hence, disintegration of a metal by its surrounding chemicals through a chemical reaction on the surface of the metal is called corrosion Example: Formation of rust on the surface of iron, formation of green film on the surface of copper The responsible factors for the corrosion of a metal are the metal itself, the environmental chemicals, temperature and the design. This localized form of corrosion is characterized by the formation of irregularly shaped cavities on the surface of the metal. Their diameter and depth depend on several parameters related to the metal, the medium and service conditions. Unlike uniform corrosion, the intensity and rate of pitting corrosion can be assessed neither by determining the mass loss nor by measuring released hydrogen Pitting corrosion can be assessed using three criteria : the density, i.e. the number of pits per unit area, the rate of deepening and the probability of pitting .In fact, these measurements do not make sense because a very deep and isolated pit results only in a small mass loss, where as a very large number of superficial pits can lead to a larger mass loss.

MATERIALS AND METHODS

Belt abrasive materials

Alumina-zirconia abrasive grain consists of a fused alloy of aluminum oxide and oxide and zirconium oxide. The resulting fine structure and higher hardness contributes to improved grinding performance on stainless steel, titanium and other exotic metals. offers the widest grit range (24-600) & the widest range of backing cloths- "X"(heavy),"J"(Flexible),"JF"(Very flexible).It is also the only product in the finer grit range that is suitable for blades & handles The flexible backings are obviously good for contour work The lowest initial cost. range 36-180.Good at the coarse end offering faster cut, longer life & higher stock removal than Aluminium Oxide Cost about 15% more than Aluminium Oxide but worth it if you are removing metal

Design of the abrasive belt



DISCUSSION

It was originally thought that abrasive wear by grits or hard asperities closely resembled cutting by a series of machine tools or a file. However, microscopic examination has revealed that the cutting process is only approximated by the sharpest of grits and many other more indirect mechanisms are involved. The particles or grits may remove material by micro cutting, micro fracture, pull-out of individual grains or accelerated fatigue by repeated deformations The first mechanism illustrated in cutting, represents the classic model where a sharp grit or hard asperity cuts the softer surface. The material which is cut is removed as wear debris. When the abraded material is brittle, e.g. ceramic, fracture of the worn surface may occur In this instance wear debris is the result of crack convergence. When a ductile material is abraded by a blunt grit then cutting is unlikely and the worn surface is repeatedly deformed In this case wear debris is the result of metal fatigue. The last mechanism illustrated represents grain detachment or grain pull-out. This mechanism applies mainly to ceramics where the boundary between grains is relatively weak. In this mechanism the entire grain is lost as wear debris. The mechanisms of abrasive wear is extremely interesting for interpreting the wear because abrasive wear is very common type of wear in mining, agriculture, cement industry civil engineering, metallurgy Depends of the mechanisms we can prepare working surfaces with exact chemical composition and heat treatment for example by hard facing technologies Abrasive wear occurs whenever a solid object is loaded against particles of a material that have equal or greater hardness. A common example of this problem is the wear of shovels on earth-moving machinery. The extent of abrasive wear is far greater than may be realized Any material, even if the bulk of it is very soft, may cause abrasive wear if hard particles are present. For example, an organic material, such as sugar cane, is associated with abrasive wear of cane cutters and shredders because of the small fraction of silica present in the plant fibres. A major difficulty in the prevention and control of abrasive wear is that the term abrasive wear does not precisely describe the wear mechanisms involved. There are, in fact almost always several different mechanisms of wear acting in concert, all of which have different characteristics. It is supposed by some that gravitation causes downward-oriented concentration gradient of the dissolved ions in the hole caused by the corrosion, as the concentrated solution is denser. This however is unlikely. The more conventional explanation is that the acidity inside the pit is maintained by the spatial separation of the cathodic and anodic half-reactions, which creates a potential gradient and electro migration of aggressive anions into the pit. this kind of corrosion is extremely insidious, as it causes little loss of material with small effect on its surface, while it damages the deep structures of the metal. The pits on the surface are often obscured by corrosion products. Pitting can be initiated by a small surface defect, being a scratch or a local change in composition, or a damage to protective coating. Polished surfaces display higher resistance to pitting. In the diagram it is clearly explain that the pitting corrosion how happened and affect the surface of the metal parts

CONCLUSION

The various form of rust formed in seamless pipe which are used in the The pipe they are rust formed Uniform corrosion Pitting corrosion Transgranular and Intergranular Exfoliation corrosion Stress corrosion Crevice corrosion Galvanic corrosion Erosion in the seamless pipe is removed by various process they use one of the rust removing process that is shot blasting process but one of the corrosion type cannot be fully removed by the shot blasting process so we are proposing a method called as auxiliary abrasive belt machine which is used to remove the excess of pitting corrosion present in the seamless pipe. For this proposal here we select the types of belt and design the belt which have abrasive particle which also been selected to remove the surface of seam less pipe in shot blasting process we remove 2-3 microns for the surface of cylindrical metal but pitting corrosion affect up to 0.1mm so this auxiliary machine to remove 0.3 mm of surface of metal

References:

[1]. Alcala, J., Barone, A.C. & Anglada, M. (2000). The influence of plastic hardening on surface deformation modes around Vickers and spherical indents, Acta Materialia, Vol. 48,No. 13, pp. 3451-3464, ISSN: 1359-6454.

[2]. Beste, U. & Jacobson, S. (2003). Micro scale hardness distribution of rock types related torock drill wear, Wear, Vol. 254, No. 11, pp. 1147-1154, ISSN: 0043-1648.

[3]. Bozzi, A.C. & De Mello, J.D.B. (1999). Wear resistance and wear mechanisms of WC–12%Co thermal sprayed coatings in three-body abrasion. Wear, Vol. 233–235, December,pp. 575–587.

[4]. Broz, M.E., Cook, R.F. & Whitney, D.L. (2006). Microhardness, Toughness, and Modulus ofMohs Scale Minerals, American Mineralogist, Vol. 91, No. 1, pp. 135–142, ISSN: 0003-004x.

[5]. Buttery, T.C. & Archard, J.F. (1970). Grinding and abrasive wear. Proc. Inst. Mech. Eng.,Vol. 185, pp. 537-552, ISSN: 0020-3483.

[6]. Coronado, J.J. & Sinatora, A. (2009). Particle size effect on abrasion resistance of mottled castiron with different retained austenite contents, Wear, Vol. 267, No. 1-4, pp. 2077-2082

[7]. P.J. Katchmar, "OPS Overview & Regulation Update," Rocky Mountain Short Course, Jan 27, 2000

[8]. "Pipeline Safety—The Office of Pipeline Safety Is Changing How It Oversees the Pipeline Industry," No. GAO/RCED-00-128, Report to Ranking Minority Member Committee on Commerce, House of Representatives, May 2000