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A Sustainable Design for Shaft Straightening Process using Hydraulic Jack

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***Abstract:** This paper deals with improvements in shaft straighteners. It is particularly for straightening the shafts used in the submersible pumps which become bent in service. It has been found that the shafts of submersible pumps become bent from various causes and however the shafts being bent from end to end. The method used before for correcting this condition usually involved hydraulic press, in that deflection is measured separately by using dial gauge and removed separately by using hydraulic press. Such a method however is objectionable as it is not only slow and laborious but also produces uncertain results. The experimental set up consists of hydraulic jack, travelling ram with bearings and dial gauge are using for removing the deflection in the shafts. This method is most suitable and needs less time for removing the bends in the shafts.*
***Keywords:** hydraulic jack, submersible pump, shaft straightener, travelling ram*

I. INTRODUCTION

A submersible pump is a pump that can be placed underwater and still carry out its intended purpose. Some pumps are working in the fully submerged condition, and others is kept in a dry place. It is necessary to know that which type it is, for using. It is able to be used in some of other applications such as fountain pumps, borehole pumps and well pumps. It protect the motors from the liquid being pumped when they are working. The motors are usually placed in a water tight compartment filled with oil, and most motors are electric. It are more efficient than jet pumps. There are various elements used in the submersible pump from that hexagonal shaft is important one.

Shafts are a basic, important and very common machine element. It is usually designed to perform a specific task in a specific machine. There are many similar machines are produced for the several applications which is done by shafts. Generally has no use outside the machine for which it was designed. There is design for fulfil these requirements. Shafts are used for several different applications and for different purposes. Small diameter hexagonal shafts, such as, for example, shafts which is used in the submersible pumps, are subject to bending which can occur during manufacturing, processing or in subsequent use.

Straightness in shafts is of primary concern in submersible pumps that operate at high rotational speeds and have internal liquid sealing clearing of only a few thousandths of an inch. An un-straight shaft can result in:

A. Excessive pump vibration.
B. Seizure of the internal metallic components.
C. Improper coupling alignment between pump and driver.
D. Cyclic bending fatigue and shaft failures.

II. PROBLEM IDENTIFICATION

We are identified the problem in the shaft straightening process carried out in the manufacturing section of pump industry. In that section, the process which is currently in use is slow and tedious. So the production gets affected.

A. Objective

The primary objective of the present invention is to provide a simplest method for straightening the shafts without any difficulties.

Another objective of the invention is to increase the production rate of submersible pumps by reducing the time consumption of shaft bend removal process.

III. METHODS OF CORRECTING SHAFT RUN OUT

Straightening shafts can be an issue either during initial manufacturing or as discovered during an inspection of the pump at repair. That the straightness of 0.01 to 0.05 inch is accepted. Production errors are made, so the industries faces the problem of straightening the bent shaft.

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Three main methods can be used to straighten a pump shaft:

A. Hot Spot Method

The hot-spot method involves quickly heating a local spot (on the outside of a bend) to an elevated temperature. Due to heat in the region tends to expand, and due to the elevated heat, strength of the material is also reduced. Because of these heat metal is totally damaged. The strength of the metal is getting damaged after the cooling process, because of the releasing of residual stresses.

1) Disadvantages:

a) This is a very time consumption process.
b) It takes more time for cooling.
c) Material properties of the metal is also affected.

B. Peening Method

It is a hammer or equivalent technique used to hammer or peen the shafting surface on the inside of a shaft bend. Compressive stresses are occurred in the shaft.

1) Disadvantages:

a) It is not preferred for the large diameter shafts.
b) There is more strength are needed are for removing the bent.
c) Surface finish is not occurred, so the external setup is required for fine finishing the surface.

C. Cold Straightening Method

Hydraulic press and proper supports are the means for straightening the shaft until it agrees with permissible tolerances. The shaft is stored for 48 hours and then re-inspected. Shaft is out of tolerances means, it is rejected.

1) Advantages:

a) The cold straightening method comes closer to correcting the root cause of the problem for many applications. For this reason, the cold straightening method is often considered as the first choice approach.
b) It is monitored easily and regularly.
c) It uses dial gauge indicator for measuring the straightness.

IV. RESULTS AND DISCUSSION

In this above method of the straightening processes clearly brings out the merits and demerits of cold straightening process. Based on that, we have designed a new set up for the straightening process.

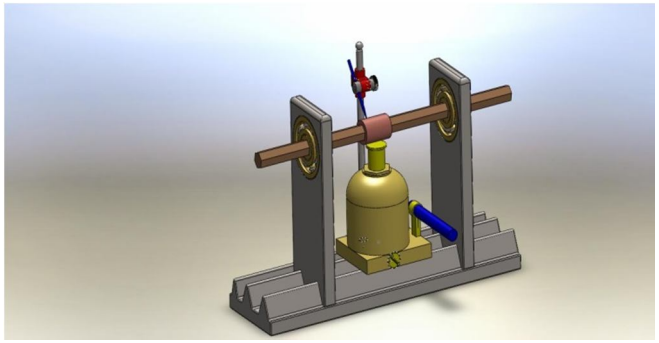


Fig.4.1 3-Dimensional model of shaft straightener

Fig.4.1 shows that the 3- Dimensional model of the shaft straightener setup. In this setup hydraulic jack, travelling ram with bearings, and dial gauge are vertically mounted on the moving guide rail bed.

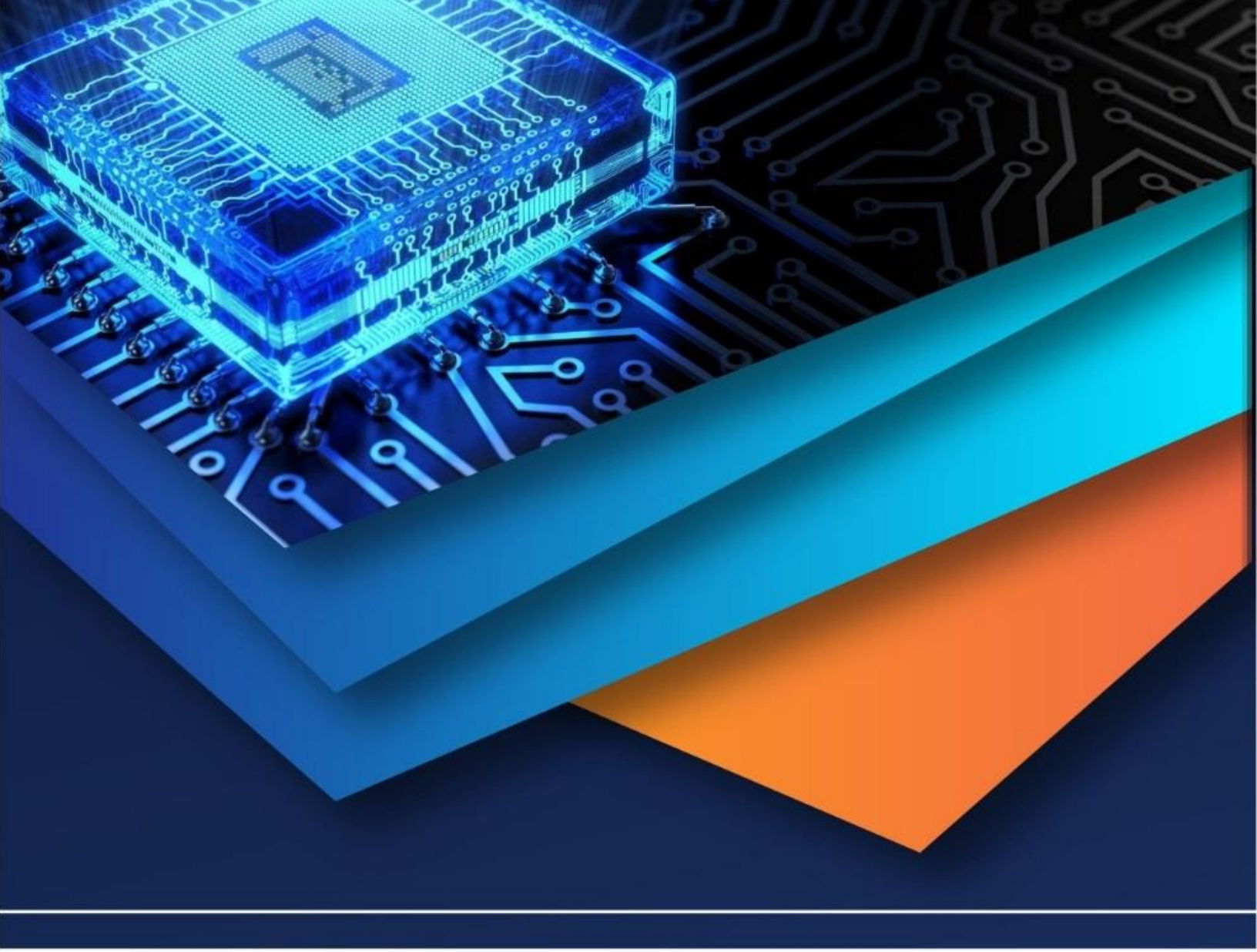
V. CONCLUSIONS

This paper presents a method for straightening the pump shafts easily and accurately. In this method cold straightening process is used for straighten the pump shafts. The experimental set up which consists of hydraulic jack, dial gauge, travelling ram, and bed with moving guide rail. The main advantage of these setup is flexibility, which means all the components are movable. So this

method is best suited for straightening the pump shafts.

REFERENCES

[1] Das Talukder, N. K., and Johnson, W., "Bar Straightening Process by Reverse Bending," Research Monograph No. 79121, Mech. Engr. Dept., Banaras Hindu University, Varanasi, 1979.
[2] Das Talukder, N. K., and Johnson, W., "On the Arrangement of Rolls in Cross-Roll Straighteners," Int. J. Mech. Sci., Vol. 23, pp. 213-220, 1981
[3] K. Kawai, M. Hayama, Recent development of rotary forming in Japan, Int. J. Mach. Tools Manuf. 29 (1), 1989.
[4] N. K. Das Talukder and A. N. Singh., "Mechanics of Bar Straightening, Part 1: General Analysis of Straightening Process," Journal of Engineering for Industry, Vol. 113/227, 1991
[5] N. K. Das Talukder and A. N. Singh., "Mechanics of Bar Straightening, Part 2: Straightening in cross roll straighteners," Journal of Engineering for Industry, Vol. 113/228, 1991
[6] The Japan Society for Technology of Plasticity: Straightening of Metal Products, Corona Publishing, Tokyo, 1992 in Japanese.T. Sano, K. Kawai, Activities of the JSTP committee on environmental issues, J. Mater. Process. Technol. 59 (3),
[7] [8] M. Kiuchi, Technology required for protection of the environment in the field of metal forming, J. Mater. Process. Technol. 59 (3), 1996.
[8] K. Kawai, Y. Tatsuki, H. Kudo., “Rotary straightening of curved shape near both ends of seamless pipe," Journal of Materials Processing Technology, Vol. 140, 2003.
[9] Graziella, K., Siegert J., and Westkamper, E., “Procedure to Improve The Understanding of The Rotating Straightening Process”, Journal of Machine Engineering, 2. 570-576, 2011.
[10] Kai Wanga, Baoyu Wanga, Chuancheng Yang.," Research on the multi-step straightening for the elevator guide rail," International Workshop on Automobile, Power and Energy Engineering, 2011.
[11] Świć A., Gola A.: Economic analysis of casing parts production in a flexible manufacturing system, Actual Problems of Economics, 3 (141), 526-533, 2013.
[12] Świć A., Taranenko W., Gola A.: Analysis of the process of turning of low-rigidity shafts, Applied Mechanics and Materials, 791, 238-245, 2015.
[13] Antoni Świć, Aleksandr Draczew, Arkadiusz Gola.,"Technology Of Heat Treating-Straightening Of Long Shafts With Low Rigidity," Advances in Science and Technology Research Journal ,Volume 10, No. 31, Sept. 2016.
[14] “A Text Book of Theory of Machines” by R.S.Khurmi.



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