Impact Factor (SJIF): 4.542

International Journal of Advance Research in Engineering, Science & Technology

e-ISSN: 2393-9877, p-ISSN: 2394-2444

Volume 4, Issue 3, March-2017

Design and manufacturing of Hydro-Pneumatic crane- A Review

Devendra Baria[1], Naresh Katariya[1], krunal Suthar[1]

[1] *Students of Mechanical Engg. Department, Vadodara Institute of Engineering, Vadodara, India*

Abstract —A crane is a type of machine, generally equipped with a hoist, wire ropes or chains, and sheaves, that can be used both to lift and lower materials and to move them horizontally. In the present, crane are powered by fossil fuel which emits black smoke and is not very good for the environment. It is based on hydro & pneumatic medium. We wanted to design a futuristic Crane that would be operated when fossil fuels run out. Renewable bio fuels are important because soon enough we won't have any gas to power cars and homes. Compressed air may be used alone in a fluid power application, or it may be used in combination with hydraulic components to maximize the advantages of both forms of fluid power. This project is fully working on Hydro-Pneumatic technology and works very efficiently, speedily and powerfully because it uses both the interfaces: Hydro power & Pneumatic power. Pressure is provided with the help of Air-water tank. Thus this technology is known as hydro-pneumatic.

Keywords- crane, material handling, pneumatic, hydraulic, fabrication

I. *INTRODUCTION*

Compressed air may be used alone in a fluid power application, or it may be used in combination with hydraulic components to maximize the advantages of both forms of fluid power. The project working with fully hydro-pneumatic technology the project working with technology limitation solved because our project powerful speedily process. The project has two interfaces such as,

1. Hydraulic
2. Pneumatic

In this technology for operation not required any hydraulic pump. Because pressure is provide by potential air-water tank. So, this technology called hydro-pneumatic system. The hydro-pneumatic pressure system is a modernization of the older gravity tank method of water supply. Its main purpose is to control or boost a limited supply pressure to a higher or more uniform value so that a continuous and satisfactory water supply will be available at all fixtures within the system. Handling of parts from Machining shop or Assembly line application. It can be used as completely automatic system by using microprocessor and PLC circuit and reduce the human effort and easily controlled the operation.

Global warming, a direct result of the increased imbalance of gases in the atmosphere has come to be known as the biggest threat and challenge that the contemporary world has to overcome in a bid for survival. Purity of air is prime necessity for the people as far as their health is concern. The average adult, when resting, inhales and exhales about 7 or 8 liters of air per minute. That totals about 11,000 liters of air per day. Noise pollution affects both health and behavior. Unwanted noise can damage psychological health. Noise pollution can cause hypertension, high stress levels, tinnitus, hearing loss, sleep disturbances and other harmful effects. Today, excessive noise pollution which, in the long run, may cause permanently reduced hearing. As a consequence, authorities now demand that noise levels are kept below certain limits. An aqua silencer System is designed to replace conventional single unit engine silencers on board structures. It is used to control the emission and noise in I.C. engines.

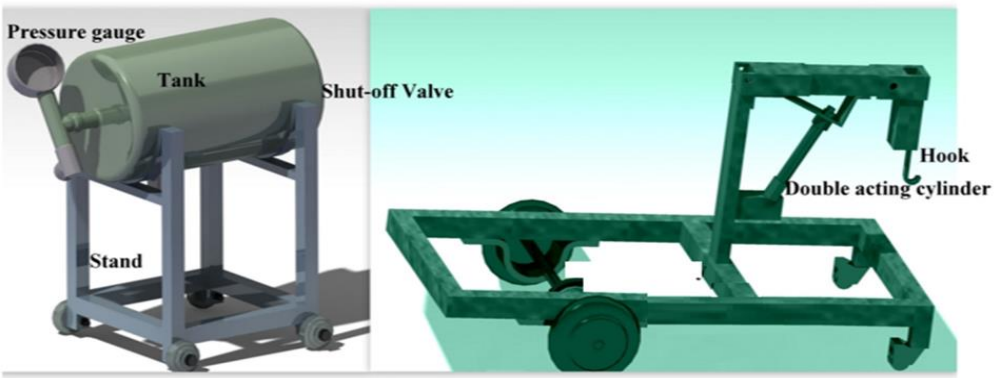

Fig. 1 Working Hydro -Pneumatic

A hydro compress crane works on a hydraulic and pneumatic principle. As shown in above figure the compressor pressurized air at 7 bar pressure which is pressurized into water tank by air inlet valve. The pressure inside the tank is indicated by a bourdon tube pressure gauge. After the completed the pneumatic operation fills up the water into a tank about a 60 % of total volume of tank. Then again for hydro- pneumatic operation air is pressurized into a water tank at 7 bar pressure. When the flow control valve is opened the pressure of air-water is comes into a T-valve the T-valve is dividing the pressure line into two pressure line. This pressure line is connected with 5/2 direction control valve.

II. LITERATURE SURVEY

Many hybrid technologies are arriving which intend in reducing the fuel usage there by increasing the fuel economy and also reduced exhaust emission. The major hybrid now in market is being electrical. We build a pneumatic hybrid crane in which the crane is being powered up by an internal combustion engine and an air engine; output is being taken up as desired. The air hybrid engine absorbs a part of crane's kinetic energy, stores it in an air tank in the form of compressed air, and reuses it to propel a crane during cruising and acceleration. Capturing, storing and reusing the energy to give additional power can therefore improve fuel economy, particularly in cities and urban areas where the traffic conditions involve many stops and starts. Though some of the renewable energy sources like solar energy, bio fuels are currently in practice, we are focused on pneumatic technology, since pneumatic applications are wide all over the world, basic components and other equipment are easily available and the fabrication is not so tough. Thus, the pollution and fuel consumption of the internal combustion engine cranes can be minimized by the use of the pneumatic hybrid cranes.

In a pneumatic system, the working fluid is a gas (mostly air) which is compressed above atmospheric pressure to impart pressure energy to the molecules. This stored pressure potential is converted to a suitable mechanical work in an appropriate controlled sequence using control valves and actuators. Conversion of various combinations of motions like rotary-rotary, linear-rotary and linear-linear is possible. The simplicity in design, durability and compact size of pneumatic systems make them well suited for mobile applications. Pneumatic control system plays very important role in industrial system owing to the advantages of low cost, easy maintenance, cleanliness, readily available, and cheap source, etc.

[1]. A particularly well suited application for crane operating on compressed air is material handling and for visitors in industry. Compressed air storage energy (CASE) is a promising method of energy storage, with high efficiency and environmental friendliness [2]. Compressed air is regarded as fourth utility, after electricity, natural gas, water and the facilitating production activities in industrial environment [3]. Unfortunately production of compressed air solely for pneumatic crane is not affordable but in manufacturing industries compressed air is widely used for many applications such as cooling, drying, actuating and removing metal chips. In addition, as a form of energy, compressed air represents no fire or explosion hazards; as the most natural substances, it is clean and safe and regarded as totally green [4]. The performance of air car is explain in which the importance of the impact of the fossil fuels in the present and future generations is explained which led them to design a new crane which runs by renewable energy sources. Compressed air crane are more suitable for low speed, short range and flammable environment [5].An inventor, JemStansfield, has been able to convert a regular scooter to a compressed air moped. The moped has top speed of about 18 mph and could go 7 miles before its air pressure ran out.

During literature survey it is observed that compressed air cranes has many potential advantages over electric cranes which includes no degradation problems of batteries, time required for refueling the tank, easy disposal of compressed air tank without causing any pollution as with the batteries.

III.CONCLUSION

On the basis of literature survey, it can be conclude that different mechanical application machine can be operated with use of air and water as a working fuel which is freely available (no need of change in fluid like oil used in hydraulic system). Compressed air can be stored easily and once compressed above a certain threshold level; the system can be operated without further need of compressing. This feature allows us to use it even when electrical power is lost. The system is capable of handling variable loads by varying the pressure. The system converts the vertical flow of the materials into horizontal with minimum space utilization. Currently the crane is not working with the use of this combination method of actuation. So by use of this method in crane actuation, it is able to carry moderate load (upto 10 kg.) at medium pressure (5-6 bar) and the system is also semi-automatic which results in highly reduction in man-power.

IV.REFERENCES

[1] Yogendra Tyagi,Vedansh Chaturvedi,Jyoti Vimal "Parametric optimization of CNC Hydarulic and pneumatic machine Analysis" International Journal of Engineering Science and Technology (IJEST)Volume 4 No-8 August 2012.

[2] Nourredine Boubekri "An investigation in hydarulic and pneumatic using minimum quality lubrication" Vol. 1 No. 5; September 2011.

[3] Timur Canel,A. Ugur Kaya,Bekir Celik "Parameter optimization of hydarulic and pneumatic on Taguchi method" 44 (2012) 2347-2353

[4] Mr. P.N.E. Naveen, Mr. M. Yasaswi, Prof. R. V. Prasad "Experimental investigation of hydarulic and pneumatic parameters " (ISORJMCE) 2278-1684 Vol.2, Issue 3 (sep-Oct 2012), pp. 30-37.
[5] Thiren G. Pokar,Prof. V. D. Patel "Optimization of hydarulic and pneumatic process parameters" IJMER Vol. 1, Issue 2, March 2013
[6] B.Shivapragash,K.Chandrasekaram,C.Parthasarathy,M.Samuel "Multiple response optimization in hydarulic and pneumatic using analysis" (IJMER) Vol. 3, Issue 2, March April 2013,pp-765-768
[7] Mohan Sen,H. S. Shan "A review of electrochemical hydarulic and pneumatic processes" International journal of machine tool and manufacture 45(2005) 137-152.
[8] Wen Jialing and Wen Pengfei [4] "The simulation and optimization of aspheric plastic lens injection molding". Vol.20 No. 2 Journal of Wuhan University of Technology Jun 2005
[9] C.Y. Yeo,S.C. Tam,S. Jana,Micheal W.S. Lau "A technical view of hydarulic and pneumatic of aerospace materials" Journal of materials processing technology 42 (1994) 15-49