

DESIGN & FABRICATION OF INSTALLATION & DE-INSTALLATION OF DESSERT COOLER MECHANISM USING WIRE ROPE WINCH

¹Sayyad Ayaz Ali, ²Mohammad Tausif Sheikh, ³Mohammad Uzair, ⁴Sohail Athar, ⁵R. N. Dehankar

¹UG Student, ²UG Student, ³UG Student, ⁴UG Student, ⁵Asst. Professor MECH
Department of Mechanical Engineering,
Anjuman College of Engineering and Technology, Sadar, Nagpur, India

Abstract : In order to understand the difficulty and problems in installing a dessert cooler in a multi-storey building, this study has been done. As everyone cannot afford air conditioners because of its cost and electricity consumption is high so to reduce such inconvenience and for the very purpose a mechanism have been designed which will help to install cooler in easy manner. The research state's about the selection and design building mechanism for installation and de-installation including the maintainence of a dessert cooler for a multistory building.

IndexTerms – Wire rope winch, structure, mechanism

I. INTRODUCTION

In a multistory building, installation of dessert cooler is a difficult task as it requires a lot of human efforts for the installation and de-installation process and fix the cooler in window. Once the cooler is installed and fixed in the window its maintainence also increases, apart from this if anyone thinks of replacing the dessert cooler with air conditioners then electricity consumption for air conditioner's also increases in a large amount which is not affordable by a common man. So for this reason, research has been made that if the dessert cooler installation is done by rope will help in reducing this inconvenience and installation process also becomes easier along with making the maintainence cost cheaper.

Basically, winch is a mechanical device which is used to pull i.e. wind up or let out i.e. wind out or otherwise anything that is used to adjust the tension of a rope or wire rope also can be a cable or a cable wire. Wire rope winch is a material which is used for loading or handling heavy loads. Various applications of wire rope winch have been found in the field of automobiles, construction, machinery, aeronautics, elevators, shipping, mining and many more to a date. Elevator is day-to-day example of wire rope winch which can be seen by anyone on daily basis. An interesting advantage of using the concept of wire rope winch is that it does not require any electricity consumption to operate which makes it cheaper to use regularly and also does not require much human efforts which makes it possible to operate by anyone. Skilled operators are not required for this and hence anyone can use this method. The mechanism here is used by mounting it on the top of the building and cooler is to be placed in a structure which is attached to the wire rope winch mechanism.

II. OBJECTIVE

The objective of this study is to reduce the maintainence and human efforts required by installing dessert coolers with the help of a wire rope winch.

III. DESIGN METHODOLOGY

The project states about the use and selection of the design and suitable mechanism for installation and de-installation of dessert cooler along with its maintainence for a multistory building. Different concepts like load calculation, fabrication, structure, gear mechanism, wire rope, power, etc have been used. Detailed information about the concepts used can be understood with the help of the below figure.

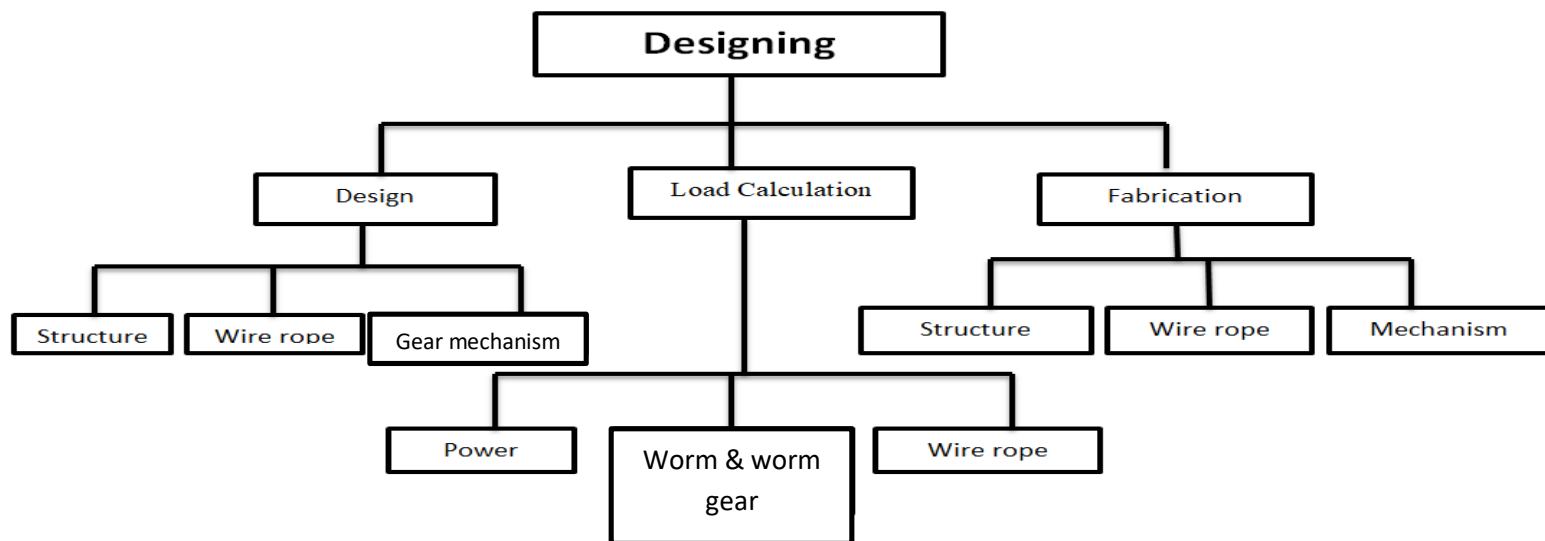


Fig. (1) – Design methodology used in the project

IV. PRELIMINARY DESIGN:

Preliminary design involves structure, worm and worm gear mechanism for lifting the cooler. Design of structure worm and worm gear mechanism is done on solid works. After designing work is done, the mechanism check whether the rope is capable of lifting load or not. For analysis of load ansys software is used, ansys software gives information about all the stress and strain obtained over the rope during lifting the load along with the reactions and critical point under defining loading condition which takes place.

V. CHARACTERISTICS OF STRUCTURE:

For construction of structure mild steel bar of L-shape having an appropriate thickness of 25 to 150 mm is used as per the required weight and size of the cooler to be installed. Generally, mild steel is used because it have good corrosion resistance capacity and have high strength to lift heavy loads. Flexibility is comparatively good of these steels as compared to other materials. It is also easily available material having cheap price to purchase making it easily affordable. Another characteristic which makes it impressive to use is its good welding capability and capacity to be stable for long time. It does not crack easily unless and until some extra force is applied to it. Any type of such steel can handle more than 1000 kg of weights. Its ultimate strength is 84/mpa.

The structure designed during the project is detachable, so that after the need is over of cooler it can be easily detach and is not consuming much space for its storage. There is a provision to adjust the structure as per the size of cooler, required top and bottom of the structure are welded properly because there is much load acting on these areas. To increase the strength bearing capacity of the structure welded points have been used as these points have high load bearing capacity. Remaining parts of the entire structure are bolted together with the help of nuts and bolts making the structure easily portable and detachable.

Four hooks have been placed at the top of the structure so that the wire rope can be easily attached to the structure. Hooks are also welded in a proper manner as these section is having much load. Entire structure load is handled by these hooks, hence they should be welded properly. Rollers have been used to make more comfortable the movement of ropes in the bottom and front side of the structure. Rollers also help to reduce the shocks and vibrations which takes place during installation and de-installation process of the dessert cooler.

VI. SELECTION OF GEAR MECHANISM:

Various gear mechanisms have been used for making the lifting mechanism easier to lift up the load without applying more efforts for the process. There are basic three types of lifting mechanisms been used: (1) Rotory Mechanism

(2) Linkage Mechanism

(3) Elevator

Using elevator mechanism lifting of cooler and structure is done with the help of a wire rope and worm and worm gear drive i.e. wire rope mechanism. Maximum weight capacity of the cooler including the structure, water is 600kg – 800kg, so for lifting these loads a simple and affordable mechanism is been used on easily affordadable amount so that everyone can easily adapt these mechanism without requiring huge amount of skills. Thus the mechanism is easily operable.

The lifting mechanism is mounted on the top of the roof of building which includes a stand consisting of the drum, pulley, gear box and other required items also. Inter locking system is also provided i.e. provision in the drum to hold the cooler in various heights as per the requirements.

VII. GEAR BOX ARRANGEMENT

The different types of gear mechanism used in lifting are as follows:

- (1) Spur gear arrangement
- (2) Helical gear arrangement
- (3) Worm-worm gear arrangement
- (4) Combination gear arrangement

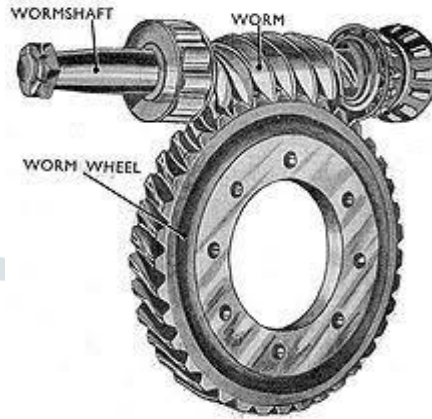


Fig. (2) Worm and Worm Gear Arrangement

The fact that worm-worm gear arrangement is very simple makes it capable of using it in almost all types of lifting mechanisms. Besides, it reduces maximum human efforts and it does not occupy more space in the gear box. Only one gear pair is used in this arrangement. Worm gear arrangement also gives high speed reductions.

IX. WIRE ROPE SELECTION

After selecting material for cooler structure and lifting mechanisms i.e. the winch mechanism, selection of suitable wire rope also plays an important role in the study. Ropes and chains have played many uses in hauling/hoisting applications for centuries. The number of using chains have been reduced to a greater extent now-a-days because of its weight and usual blockages that occur after sometime. Wire ropes are more flexible in operation and symmetrical cross section of ropes allows multiple boundings. Today, wire ropes find its various applications in various sectors like automobiles, shipping & mining, construction and elevator, etc. For this project, 6 * 19 strands of rope wire having a standard diameter 8mm to 10 mm is used, for the loading condition of 6kN.

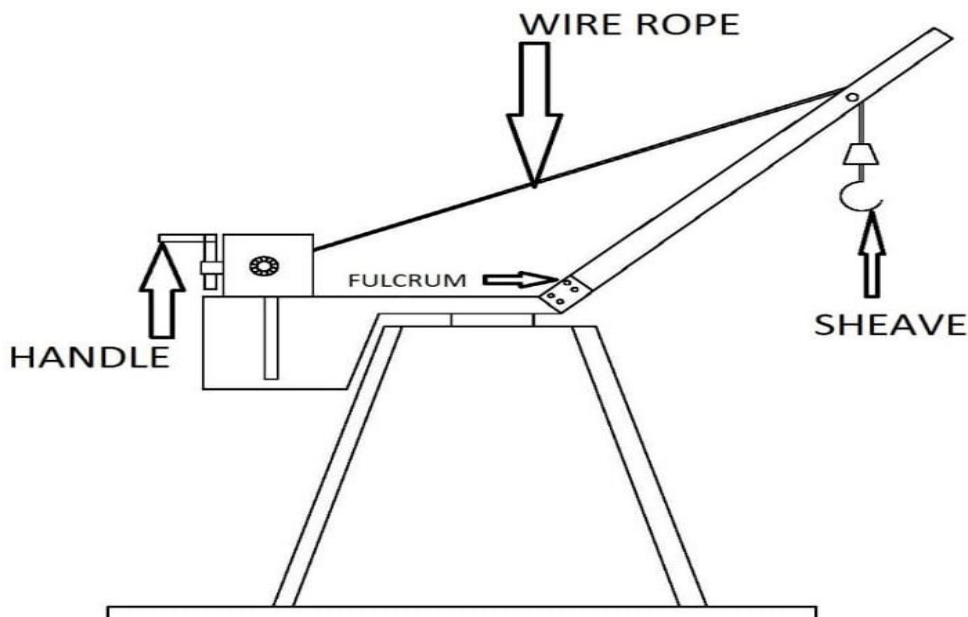


Fig. (3) Wire Rope Winch Mechanism

X. CONCLUSION & FUTURE SCOPE

Due to shortage of spaces and congested lifestyle, multistory buildings are constructed. As far we are concern temperature is rising day by day, and not everyone is having the capability to afford air conditioners still everyone want cool environment in their house to live. Air conditioners are also a good option but not everyone can afford it so dessert coolers are used because it is easily available on low cost and does not require huge maintainence and investments. The project will help many people to install and de-install the dessert cooler on less human efforts. Many people will able to afford it and fix it on regular basis as it does not require much human efforts and because of the ease in installation and de-installation process. In near future, the same will be of much profitable to a common human being for living their life in cool and calm environment instead of living in a heated environment.

From the study, we can conclude that the rates of air conditioners are increasing day by day and hence not everyone can afford it. So for multistory buildings a simple and easier mechanism which includes installing and de-installing of a dessert cooler using a wire rope winch have been made easily available for a common human being which can be installed and de-installed without much human efforts and at cheap prices. These is also leading to change lifestyle of a common people.

XII. REFERENCES

- Machine Design 2005: by R.S Khurmi and J.K Gupta
- Theory Of Machines- American Heritage: by S.S Rattan
- Design of Machine Elements: by B.D Shiwalkar
- Wire Rope Selection for Manual Winch Application Moses Frank Oduori and Thomas Ochuku Mbuya, School of Engineering, The University of Nairobi.
- Research on the Design and Modification of Asymmetric Spur Gear.
- <http://ourmechanicalengg.wordpress.com/>
- <http://mechanicalstudents.com>
- <http://www.dometrics.com>
- <http://www.liftingequipments.com>

