Design and Fabrication of Structural Strength Test Rig For office Chair

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***Abstract*: The standard is intended to provide manufacturers, and users with a common basis for evaluating the safety, durability, and structural adequacy of general-purpose office chairs. General-purpose office chairs are normally use in an office environment and may include, but are not limited to those seating styles typically referred to as: executive/management, task/secretarial, side/guest chair, nesting folding chairs, tablet arm chair and stools. This standard describes the means of evaluating general purpose office chairs, independent of construction materials, manufacturing processes, mechanical designs or aesthetic designs. This standard does not address lounge seating, flammability, surface material durability, cushioning materials, product emission, or ergonomic considerations. The standard defines specific tests, the laboratory equipment that may be used, this condition of tests, and the minimum acceptance levels to be used in evaluating general purpose office chairs. The acceptance levels and the test parameters given in this standard are based on the actual field use and test experience of BIFMA members. Where appropriate, the national health and nutrition examination survey (NHANES) 2007-2010 study, which indicates the weight of 95th percentile male is 125KG (275 pounds) was used in the development of the test. This does not means that users with weights above the percentiles referenced cannot safely or comfortably use a chair developed to a given BIFMA standard. The test was developed with an estimated product life of ten years based on single-shift usage. Product life will be affected by the user size/weight, product use, care and maintenance, environment and others factors and as product compliance to this standard does not necessarily guarantee a ten years product life. The tests in this standard are intended to access the performance of the new products only. They are not intended to access a product that has been in use.**

***Keywords*: office chair, BIFMA, ergonomics.**

I. INTRODUCTION

This test is intended to provide manufactures, specifiers, and users with a common basis for evaluating the safety, durability, and structural adequacy of general-purpose office chair. General-purpose office chair are normally use in an office environment and may include, but are not limited to those seating styles typically referred to as: executive/management, task/secretarial, side/guest chair, nesting folding chairs, tablet arm chair and stools. This standard describes the means of evaluating general purpose office chairs, independent of construction materials, manufacturing processes, mechanical designs or aesthetic designs. This standard does not address lounge seating, flammability, surface material durability, cushioning materials, product emission, or ergonomic considerations. The standard defines specific tests, the laboratory equipment that may be used, this condition of tests, and the minimum acceptance levels to be used in evaluating general purpose office chairs. The acceptance levels and the test parameters given in this standard are based on the actual field use and test experience of BIFMA members. Where appropriate, the national health and nutrition examination survey (NHANES) 2007-2010 study, which indicates the weight of 95th percentile male is 125KG (275 pounds) was used in the development of the test. This does not means that users with weights above the percentiles referenced cannot safely or comfortably use a chair developed to a given BIFMA standard. The test was developed with an estimated product life of ten years based on single-shift usage. Product life will be affected by the user size/weight, product use, care and maintenance, environment and others factors and as product compliance to this standard does not necessarily guarantee a ten years product life. The tests in this standard are intended to access the performance of the new products only. They are not intended to access a product that has been in use.
ISO 17025 requirements for measurement uncertainty do not apply this standard.

II. PROBLEM IDENTIFICATION

- There is no way to identify the life of product based on repetitive movement of user while seating.
- Frequency of use is not possible set because we cannot identify the failure.
- Loss of serviceability to chair.
- Design failure mode and effect analysis not possible to conduct
- Manufacturing defect found
- Weighing capacity of chair does not determine.

III. OBJECTIVES

- To develop the structural strength test rig.
- Design the structural strength test rig.
- Validation of Structural strength through test rig.
- To develop CAD model

IV. LITERATURE REVIEW

ANSI/BIFMA X5.1 Office Chairs is typically used to provide safety and performance requirements for chairs that are primarily designed for use in an office environment. Examples include but are not limited to seating styles typically referred to as: executive/management, task/secretarial, side/guest chairs, nesting and/or folding chairs. These chairs are for single occupants and the tests are based on the 95th percentile male body weight (currently 275 lbs.). Chairs may include features such as: stacking, stool, tablet arm.

ANSI/BIFMA X5.11 Large Occupant Office Chairs is very similar to X5.1 except the tests are based on the 99.5th percentile male body weight (currently 400 lbs.) and the minimum seat width shall be 22 inches.

ANSI/BIFMA X6.1 Educational Seating offers many tests based on X5.1 but is typically used for seating products that are primarily designed for use in schools (K-12) and colleges/universities. It includes chair-desks, tablet-arm products, convertible bench/tables; in addition to many of the types of chairs and features described in X5.1. This standard provides guidance for three sizes of chairs based on seat height. The small and medium size chairs may be more suitable for K-6 environments catering to smaller users. The large size is based on the 95th percentile male body weight.

ANSI/BIFMA X5.4 Lounge & Public Seating provides safety and performance equipments for seating that is primarily designed for use in indoor common or shared spaces such as: waiting, reception, patient rooms, restaurant/dining/cafeteria settings, and other gathering areas. Public seating includes products with single or multiple seat units, arena folding chairs, and standard folding chairs. Public and lounge seating may be ganged or otherwise connected. Seating units that must be attached to the building structure for support or stability purposes are not specifically addressed in this standard (though aspects of this standard may nonetheless be useful). The tests are based on the 95th percentile male body weight.

V. CONSTRUCTION

- After generating all conceptual designs the next step available was to select an appropriate chair design in order to fabricate it.
- The next part was to design the model by using AUTOCAD software.
- After the best concept was selected the next available part was to select each and every part of the model.
- The following parts were selected for manufacturing the model:-

- **Pneumatic cylinder**

Pneumatic cylinder is mechanical device which use the power of compressed gas to produce a force in a reciprocating linear motion. Double-acting pneumatic cylinders are the most common type since they give the user complete control of the piston movement. Figure 3 shows how the piston and piston rod move when compressed air enters the cap-end port and the rod-end port. A negative position is when the piston rod is retracted, and a positive position is when the piston rod is extended. When compressed air enters the cap-end port, it pushes the piston forward (positively), extending the piston rod. Air is forced out of the rod-end port. To retract the piston rod, compressed air enters the rod-end port, forcing air out of the cap-end port, and forcing the piston to retract to the negative position

A.Pneumatic cylinder

- **FRL Unit**

Filter, Pressure Regulator, and Lubricator are combined in a unit. These three units together are called FRL units or Service units. Compressed air from compressor comes in FRL unit wherein, the air is filtered, controlled, and lubricated. Such prepared and controlled air is delivered to the pneumatic system.

1. Filter:

i)To prevent entrance of solid contaminants to the system.
ii)To condensate and remove the water vapour that is present in the air.
iii) To arrest submicron particles that may pose a problem in the system components.

2. Regulator:

To regulate the incoming pressure to the system so that the desired air pressure is capable of flowing at a steady condition.

3. Lubricator:

To provide lubrication for mating components of valves, cylinders etc.by forming a mist of oil and air.

B. Pneumatic cylinder

- **Relay**

We know that most of the high end industrial application devices have relays for their effective working. Relays are simple switches which are operated both electrically and mechanically. Relays consist of an electromagnet and also a set of contacts. The switching mechanism is carried out with the help of the electromagnet. There are also other operating principles for its working. But they differ according to their applications. Most of the devices have the application of relays.

- **Solenoid**

- Circuit Functions of Solenoid Valves Solenoid valves are used to close, dose, distribute or mix the flow of gas or liquid in a pipe. The specific purpose of a solenoid valve is expressed by its circuit function. A 2/2 way valve has two ports (inlet and outlet) and two positions (open or closed). A solenoid valve is an electrically powered mechanical device. As the name says, it is a valve that is used to control flow. A solenoid valve is used to manage the flow of gas or liquid. Solenoid valves perform a major function in the machinery field and make an important part of many devices. It is used quite widely and can be easily replaced by experts when required.

C. Solenoid valve

- **Flow control valve**

Flow control valves are any devices manufactured for the purpose of modifying the rate of fluid flow or pressure. They are designed to fit complex pneumatic and hydraulic systems. The flow control valves respond to signals generated by devices like temperature gauges or flow meters. The valves have simple tool orifices with a complex set of electro-hydraulic valves to adjust to the different variations in pressure and system temperature.

D.Flow control valve

VI. PROBLEM FORMULATION

- The unit base shall be restrained from horizontal movement on test surface shows one acceptance method for restraining the unit. All four corners of the base shall be restrained in both directions.
- If adjustable features are available, all adjustments shall be set at normal use conditions.
- Place a weight of 109 kg (240 lb.) in the center of the seat. If necessary to keep the weight in position, the weight may be secured.
- A cycling device shall be attached to the unit frame midway between front and rear of the seat at the height of the midpoint of the seat frame structure. Note: Where design of the unit does not permit attachment at the midpoint as specified above, a bridging device may be used.
- The cycling device shall be adjusted to apply a "push-pull" action, or alternately may be applied by alternating pull (or push) force application on alternating sides of the unit. One cycle shall consist of one outward force application and removal and one inward force application and removal.
- Apply a force of 334 N (75 lbf.) at an appropriate rate between 10 and 30 cycles per minute. The device shall be cycled for 25,000 cycles

VII. ACTUAL MODEL

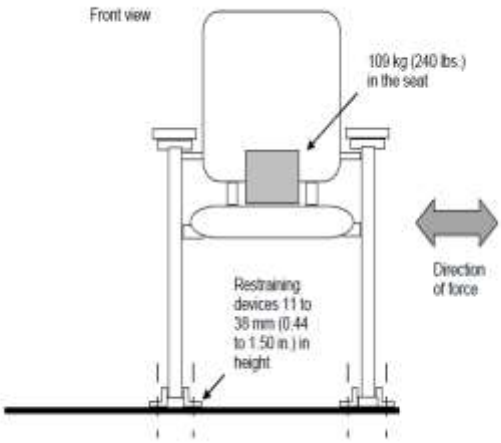

Fig 6. A: Actual model

VIII. ADVANTAGES

- Works fast and accurate over the sheet.
- Eliminate the direct contact between the thinner and workers hand.
- Consumes less time and human effort.
- Adjustable for various sizes of sheet.
- Minimum floor area required to install.

IX. DISADVANTAGES

- Vibrations may occur due to adjustable arrangement.
- Top and bottom surface may no clean properly.
- Chances of motor failure due to continuous operations.

X. CONCLUSION

In the new era of technology, people want something new in their life. They want every single thing they look in front of their life look sophisticated. People want something that can improve their lifestyle and help them to do their job by using the robot or machine. That is why development of machine and robot is now becoming quite popular and faster in marketing. So to help and give benefit to human kind the "Design and Fabrication of particle board cleaning machine" is an alternative machine that can help workers inside the workshop to clean the sheet in an effective way, which will reduce its human efforts and save time.

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